Predicting intentions to seek health information online: An integrated model

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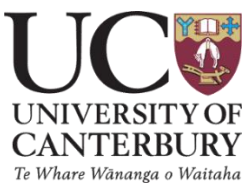

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Abstract

As a society, there is a growing trend towards health wellness and proactive health behaviours, one fundamental health behaviours is health information seeking. In the recent years, individuals have increasingly turned to health information seeking through an online system over other channels of information (Tu, 2011). The potential impact and value of online health information has also been recognised by researchers, health professionals, and public and private organisations across the world (Goldzweig et al., 2013). In 2017, more than $1.5 billion was invested in online health information initiatives in the US (Jain et al., 2017), and in New Zealand, the health information website, Health Navigator New Zealand, received nationwide support and funding from 16 district health boards. However, many of these online health initiatives have not experienced the expected uptake from consumers, and these initiatives are costly for the online system providers. Therefore it is important to understand the factors that influence individuals' intentions to seek health information using online systems.

Some studies have adapted established theory to explain intentions towards online health information seeking, while other studies have focused on exploring salient factors, many of which are vastly different to those modelled in established theory. However, few studies have provided a comprehensive model combining these factors together, and in particular, little attention has been given to incorporating information- and system-related factors from the technological environment. This study aims to address this gap in the current understanding of online health information seeking, by focusing on the information and system factors that influence intentions to seek health information online. To achieve this, the literature was reviewed and a theoretical model was developed from key concepts and theories (Theory of Planned Behaviour (Ajzen, 1991), Technology Acceptance Model (Davis, 1989) and Wixom and Todd's (2005) User Satisfaction and Technology Acceptance Model), which included information quality, system quality, source credibility, information satisfaction, system satisfaction, perceived usefulness, perceived ease of use, attitude, self-efficacy, social influence, past use, and intentions. Hypotheses were developed to understand the importance and impact of each model construct, and the data collected from health information seekers in New Zealand was analysed using Partial Least Squares Path Modeling. The results of the analysis showed support for the integration of information- and system-related factors in understanding intentions to seek health information using online systems and provided a broad view of online health information seeking intentions from both social psychology and information systems perspectives. This incorporation and emphasis of information- and system-related factors can inform online health information system providers to design, develop, and improve their systems to target the specific factors important to online health information seekers.

Introduction

1.1. Background

Information seekers today are increasingly turning to the internet over other media and sources, as a resource for health information. For instance, a survey involving over 4,000 US consumers showed that over 70% of the participants had used online or mobile resources to seek health information (Gandhi, Wang, & Dahl, 2015). Another significant development lies with the focus of health which has been steadily moving away from a disease-oriented model to a wellness and prevention-oriented model (Mark, Donaldson, & Campbell, 2011). With this, the direction of health behaviour research and development of consumer health offerings have emphasised proactive or promotional health behaviours (Bandura, 2011; Mark, Donaldson, & Campbell, 2011; Yoo & Robbins, 2008). A fundamental health behaviour, and crucial aspect of proactive and prevention-oriented health is information seeking (Lambert & Loiselle, 2007; Neuhauser & Kreps, 2003). Moreover, online health information seeking appears to have a notable influence on health behaviour (Atkinson, Saperstein, & Pleis, 2009; Fox & Rainie, 2002; Leung, 2008; Tu, 2011a). For example, prior research has found that individuals who seek health information have a higher level of general health, encouraging self-care and participation in health management (Eysenbach, 2003; Weaver et al., 2010).

The increasing popularity of online systems as a key resource for health information seekers and consumers, coupled with the shift in emphasis from a disease-oriented model to a wellness and prevention-oriented model has led to a significant increase in investments in online systems that aim to provide credible health information to consumers. In the US alone, more than $1.5 billion in funding was invested in 2017 (across 41 major investments exceeding $2 million each) to progress digital consumer health information, the top funded value proposition of online health (Jain et al., 2017). Furthermore, the recognition of value and prioritization of online health initiatives is not only relevant to the US. For example, ‘Health Navigator New Zealand’ is a New Zealand government supported online health information initiative, in 2017 it received funding support from 16 District Health Boards nationally.To be successful, it is important that these systems are used by health information seekers.

New opportunities are being created for organisations to better target the interest and needs of consumers and provide online health services that meet these demands. Online health informational systems in particular have the potential to bring many advantages to its consumers. For example, convenient and accessible health information allows individuals to save time and to obtain information at a low cost (Dubowicz & Schulz, 2015; Nettleton, Burrows, & O’Malley, 2005). Other advantages include increased feelings of confidence and empowerment in managing one’s health; here, individuals

are able to address their own information needs and fill an information void using online health information sources (Morahan-Martin, 2004; Sillence, Briggs, Harris, & Fishwick, 2007).

As society and healthcare shifts more towards preventative health and wellness, the success of online systems that provide access to health information will depend on people's willingness to use these to seek out health information. As such the topic of online health information seeking (OHIS) is a growing area of interest to researchers, health professionals, and organisations in the public and private sector (Honey, Roy, Bycroft, Boyd, & Raphael, 2014; Jain et al., 2017; Lambert & Loiselle, 2007; Morahan-Martin, 2004; Sillence et al., 2007; Walther, Pingree, Hawkins, & Buller, 2005a).

1.2. Importance

Information seekers have traditionally sought health information from channels such as leaflets, books, newspapers, family members, and health practitioners (de Vries, Mesters, & Van de Steeg, 2005; Tu, 2011). With the rate of technology assimilation in the everyday lives of individuals increasing, the use of online systems to seek health information is rapidly becoming the norm. At the same time, there are characteristics of the online channel and factors specific to the technological environment, that may impact the online health information seeking process as well as individual's perceptions about the information that these systems provide. For example, the presence of features such as source verification symbols or structural features such as site navigation and layout have been found to impact individuals' perceptions of information (Eysenbach & Köhler, 2002; Rains & Karmikel, 2009; Sillence et al., 2007). However, some individuals are apprehensive towards seeking health information online due to concerns that the information may come from sources with commercial interests or that the information has not been quality assessed, and in cases where the information is of high quality, individuals have even been observed to reject information due to poor system design (Eysenbach & Köhler, 2002; Rains & Karmikel, 2009; Sillence et al., 2007). This shift in the way in which people seek information creates a gap in that we know little about the characteristics of the online environment that influence intentions to seek health information online.

Online health information seeking may be a relatively low cost activity for consumers, but it is an expensive exercise for the providers of the online systems. Both public and private organisations are investing in these systems as there is a recognised need for quality consumer and educational health information to be available online (Honey et al., 2014; Walther et al., 2005a). In the instance of public health, governments across different countries (including New Zealand) have made significant investments into online systems to provide health information to consumers (Goldzweig et al., 2013; Honey et al., 2014). Whether these health initiatives provide an individual with general health information, location-specific health information, or access to personal health records, these online

health systems have not experienced the expected uptake from consumers (Goldzweig et al., 2013). For example, two NZ government funded initiatives (healthnavigator.org.nz supported by National District Health Boards and healthinfo.org.nz supported by the Canterbury District Health Board) are ranked very low in the popularity ranking regarding internet traffic (in the 2,000s and 5,000s respectively) when it comes to the use of these sites for seeking health information (Alexa Traffic Statistics, 2016). This is despite many of these initiatives (e.g. www.healthinfo.org.nz, www.healthnavigator.org.nz, etc.) being backed by health professionals; as such the quality of the information provided can be presumed to be high. On the other hand, other online health information providers, such as WebMD in the popularity ranking of 217 in New Zealand (Alexa Traffic Statistics, 2016), stand high despite these health sites being surrounded by connotations of fear mongering or bias towards its pharmaceutical sponsors (Bean, 2011; Heffernan, 2011, February 4; Kata, 2010). The fact that these local and credible sources attract fewer people suggests that there are other factors which influence the choice of an online source for health information. Therefore investigation is needed to understand the contributing factors of the IS environment that are key to fulfilling an individual's OHIS needs, which can impact their subsequent intentions to seek health information using the system.

Research aiming to form a better understanding of the technological environment's impact on OHIS is still in its early stages. Prior research has uncovered a broad range of salient factors that can potentially contribute to understanding the influences of an individual's intentions to seek health information using an online system. These factors include information quality, specific design features, demographics, source credibility, and more (Deng, Liu, & Hinz, 2015a; Rains & Karmikel, 2009; Reavley & Jorm, 2011; Sillence et al., 2007). Although these studies have identified various relevant factors, there is a lack of consistency between the sets of factors identified and those evaluated in research. For example, Rains and Karmikel (2009) focused on the evaluation on message characteristics (e.g. use of statistical data, author information, etc.), structural characteristics (e.g. use of imagery, navigation, etc.), website credibility, and attitude. On the other hand, Deng, Liu and Hinz (2015a) evaluates 'value' (e.g. personal health value, social value, functional value, etc.), trust, and information quality.

Few theoretically supported studies focus on the influence of key aspects of an information system (IS) (e.g. the information provided, the technical system itself) on online health seeking. Often researchers have adapted established psychology theories such as the Theory of Planned Behaviour (TPB) (Ajzen, 1991a), to explain intentions and behaviours towards health information seeking (Walsh, Hamilton, White, & Hyde, 2015a; Yoo & Robbins, 2008). Those focused on technology characteristics have primarily used theories such as Davis' (1989a) Technology Acceptance Model (TAM) to account for the technological environment (Wong, Yeung, Ho, Tse, & Lam, 2014; Yun & Park, 2010). However, the parsimonious nature of the TAM model (focusing on perceived usefulness and ease of use) means

that many other IS-related factors that may impact health information seeking, such as source credibility and information quality are unaccounted for (Kang & Lee, 2010; Wixom & Todd, 2005a). As a result, many of these theory-based studies have integrated existing theory with concepts from OHIS research, such as past experience with the TPB (Yoo and Robbins, 2008) and credibility with the TAM (Yun & Park, 2010), but the issue with consistency prevails as studies have incorporated different concepts, proposed different relationships, and produced mixed results.

OHIS research is therefore lacking in a theoretical model that incorporates key factors identified from qualitative and quantitative research, such as information quality, system quality, credibility, etc. (Cline & Haynes, 2001; Sillence et al., 2007; Yun & Park, 2010), to provide consistency amongst the set of factors examined and evaluate the significance and relationships between factors. Therefore, one of the main challenges in understanding online health information seeking is not only identifying the relevant factors of OHIS, but also to understand the impact of relationships between the factors which influence individuals' intentions towards using online systems to seek health information. More specifically, there is a need for research that focuses on understanding the impact of key factors related to the technological environment on health information seeking intentions to better inform online health information initiatives about elements to target and prioritise when developing online systems for health information seekers.

1.3. Aims

The objectives of this research are twofold. First, this study aims to address a gap in the current understanding of online health information seeking, by focusing on the technology and information aspects of online systems that influence online health information seeking. Second, this study aims to contribute to the development of a theoretical model that is informed by past literature, and established social psychology and IS theory, which can be used to gain a deeper understanding of system use intentions in online health information seeking from an IS perspective.

Two research questions will be investigated to achieve this objective:

1. What are the key factors that influence an individual's intentions to seek health information using an online system?
2. What is the impact of these factors on an individual's intentions to seek health information using an online system?

1.4. Thesis Structure

Chapter 1: Introduction

The first chapter introduces the research by providing the background on online health information seeking. The importance and relevance of the research topic is discussed along with gap in the literature, and objectives of this research.

Chapter 2: Literature Review

The second chapter reviews the prior research and theories related to online health information seeking. Consisting of three sections, the first section defines online health information seeking. The second section outlines key theories from the literature, evaluating the relevance of these to the current context and aims of this research. The third section focuses on key concepts identified from the literature that impact health information seeking. This is followed by a discussion and summary of the gaps in literature.

Chapter 3: Hypotheses Development

Drawing on existing theories and prior research, a conceptual research model is proposed that outlines key factors impacting online health information seeking, and the theorised relationships between them. These factors are discussed, and the hypotheses justified.

Chapter 4: Methodology

This chapter describes the research approach used in this study. Along with development of the research instrument and data collection methods, the data analysis approach is also explained.

Chapter 5: Findings and Analysis

This chapter reports the results of the study. First, the demographic description of the sample is presented. This is followed by results of the tests of the theoretical model, that is both the measurement model (e.g. assessment of validity and reliability of the measurement instruments used to collect the data) and the structural model.

Chapter 6: Discussion

Chapter 6 discusses the key research findings from the data analysis and evaluates the impact of each concept and significance of the relationships hypothesised in Chapter three.

Chapter 7: Conclusion

In this chapter the theoretical and practical implications of the findings from this research are discussed, followed by limitations and suggestions for future research.

Literature Review

In this chapter, the current literature will be reviewed to identify key theories, themes and concepts in online health information seeking. This chapter consists of three sections. The first section aims to introduce and define online health information seeking. The second section presents the major research models that theoretically underpin online health information seeking from both the social psychology and information systems (IS) perspectives. The final section reviews findings and key conceptual extensions presented in literature.

2.1. Online Health Information Seeking

2.1.1. What is Information Seeking?

Information is a core concept studied in information sciences, communications and marketing disciplines. The definition of information can vary for each information seeker but is broadly defined as anything from our internal or external world that is significant to the human mind, or changes a person's knowledge (Bateson, 1972; Case & Given, 2016; Marchionini, 1997). In reference to information, Wilson (1981) states that there is rarely a distinction amongst 'facts', 'advice', and 'opinion'. Whether information is fact, advice, or opinion, each type of information can be appropriate and relevant to an individual if it is perceived to fulfil an individual's needs.

Information seeking is defined as a process that individuals engage in to change their state of knowledge (Marchionini, 1997). The behaviour of information seeking is thought to arise from the purpose of satisfying an information need, guided by affective (psychological/emotional) as well as basic human (cognitive/physiological) needs (Kuhlthau, 1990; Wilson, 1981). A large underlying motivation of the information seeking process is characterised by an information need, and in fulfilment the information need is satisfied. Although strongly related to the idea of information retrieval, information retrieval is more solution-oriented whereas information seeking behaviour is more open-ended and problem-oriented, focusing on the idea of acquiring knowledge (Marchionini, 1997).

2.1.2. Defining Online Health Information Seeking

Engagement in Online Health Information Seeking (OHIS) refers to the active pursuit of health-related information using an online system. Lambert and Loiselle (2007b) state that 'seeking' is a decision and conscious intention, which does not include passive exposure to information. However, passive exposure to information can provoke seeking behaviours and intentions, therefore, OHIS intentions and behaviours can be performed proactively or reactively (Johnson, 1997).

OHIS has been demonstrated as a relevant behaviour to individuals across numerous personal and sociodemographic categories, with findings showing that educated, older individuals with a higher income to more likely engage in OHIS behaviours (Fox & Jones, 2009; Manafo & Wong, 2012; Pan & Jordan-Marsh, 2010; Rains, 2007). The appeal of seeking health information online is that there is an extensive amount available on demand. A variety of users are able to meet and satisfy different information needs, whether they require general health information, or specific health-related support from virtual communities (Eysenbach, 2003; Fox, 2010).

2.2. Theoretical Foundation

To understand health information seeking behaviour and factors that influence OHIS intentions, researchers have developed theoretical models incorporating various social psychology, consumer psychology, IS, communication, and health theories and concepts. However, a majority of the research has relied on the use of Ajzen's (1991) Theory of Planned Behaviour and Davis' (1989) Technology Acceptance Model as fundamental bases for understanding OHIS.

In this section the Theory of Reasoned Action (Fishbein & Ajzen, 1975), Theory of Planned Behaviour (Ajzen, 1991), Technology Acceptance Model (Davis, 1989) and the combined User Satisfaction and Technology Acceptance Model (Wixom & Todd, 2005) are outlined to examine their suitability for the OHIS context.

2.2.1. The Theory of Reasoned Action (TRA) and the Theory of Planned Behaviour (TPB)

The Theory of Reasoned Action (TRA) is an established social psychology theory which posits that intentions and behaviour are determined by two primary factors: 'Attitude' and 'Subjective Norms' (Fishbein & Ajzen, 1975). While the TRA explains behaviour with the assumption that it is under volitional control, a criticism to the model is the extent to which it can explain behaviour in situations where an individual is not in complete control.

Ajzen's Theory of Planned Behaviour (TPB) (1991), shown in Figure 1, extends the TRA through the addition of the variable 'Perceived Behavioural Control' (PBC), to explicitly account for perceptions of control over behaviour.

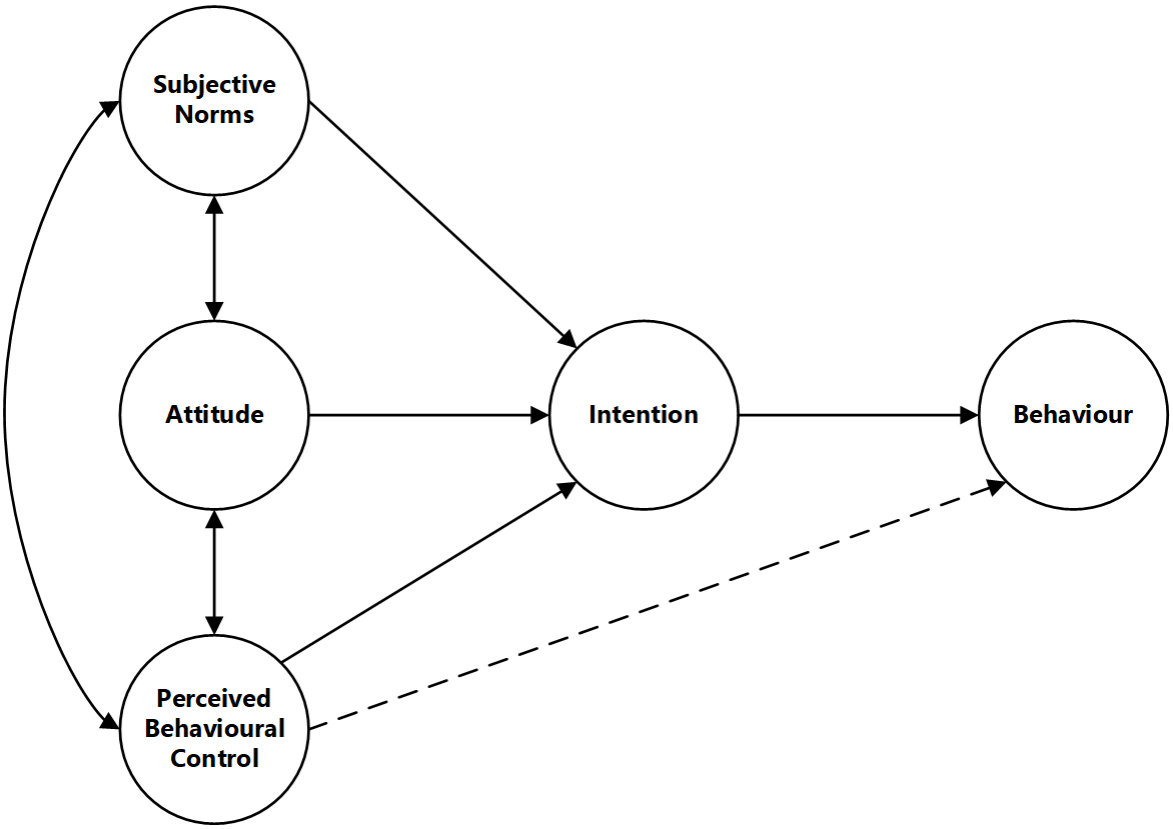


Figure 1. The Theory of Planned Behaviour. Reproduced from Ajzen (1991).

An individual's attitude refers to their tendency to respond with some degree of favourableness or unfavourableness to a psychological object (Fishbein & Ajzen, 2011) and represents their salient beliefs regarding the behaviour. This is formed through their evaluation of the outcomes of the behaviour, hence an individual who perceives a positive outcome from a behaviour would consider the performance of a behaviour to be favourable or vice versa (Conner & Norman, 2005).

Subjective norms are defined as the social pressure an individual may feel towards performing or not performing a behaviour (Conner & Norman, 2005; Fishbein & Ajzen, 2011). The construct of social influence in behavioural models indicate the direct and indirect impact that peers have on our decisions, and it is argued that the approval or disapproval of a behaviour by significant social influences (e.g. family, colleagues, or other referent individuals) has an influence on an individual's engagement of a behaviour (Ajzen, 1991; Bandura, 1977; de Vries, Backbier, Kok, & Dijkstra, 1995).

Perceived behavioural control (PBC) is defined as an individual's perceived ease or difficulty in carrying out a behaviour and is composed of two aspects: control and self-efficacy (Ajzen, 2002). Control refers to factors outside of an individual's behaviour jurisdiction, such as an unstable internet connection during a video call. Self-efficacy is defined as an individual's belief or opinion that they can successfully execute the behaviour required to produce the desired outcomes (Bandura, 1977; Fishbein

& Ajzen, 2011). While concepts of self-efficacy allude to capability perceptions of an individual, PBC refers to the overall perception of whether a behaviour is easy or difficult to perform, thus, it also encompasses control perceptions in regards to the context settings of a behaviour (Ajzen, 1991, 2002).

An individual's intentions are defined as motivations to perform a behaviour (Conner & Norman, 2005). Representing an individual's plans in terms of willingness and effort, behavioural intention is a key determinant of behaviour (Ajzen, 1991). Therefore, in the health information seeking context, the TPB postulates the link between an individual's health beliefs in terms of 'Attitude', 'Subjective Norms' and 'PBC' to directly relate to behavioural intention, and behaviour as a direct result of intention and PBC (Conner & Norman, 2005; Taylor, 2017); see Figure 1.

1.1.1.1. The TRA and TPB in Research

The TPB and TRA are established theories that are widely used across various disciplines. They have provided strong foundational and conceptual components that have been used in health-related research to model a number of different health behaviour intentions ranging from information seeking, exercise, healthy eating, oral health habits, to the use of dietary supplements and alcohol consumption (Conner, Kirk, Cade, & Barrett, 2001; Downs & Hausenblas, 2005; Fila & Smith, 2006; Grønhøj, Bech-Larsen, Chan, & Tsang, 2012; Luzzi & Spencer, 2008; Norman & Conner, 2006; Van den Branden, Van den Broucke, Leroy, Declerck, & Hoppenbrouwers, 2014).

In the context of OHIS, Yoo and Robbins' (2008) examined the OHIS intentions of middle-aged women using the TPB integrated with gratification constructs and found significant results for the linkages between the model constructs. The study analysed 354 survey responses from women between the ages of 30 to 60 in a mid-sized US city, using hierarchical multiple regression to evaluate the relationship between model variables. In line with expected outcomes, intentions to seek health-related information by middle-aged women was modelled using only the variables in the TPB; these explained 39% of the variance in intentions. Subsequently, they also found that the introduction of past experience as an antecedent to intention contributed to explaining 50% of the variance in intentions and rendered PBC insignificant. This finding supported the notion that under conditions where control needs are either met or stabilised, past experiences can hold a strong predictive power for future behaviour and intentions (Ouellette & Wood, 1998).

Other studies by Walsh, Hyde, Hamilton and White (2015; 2012) examined the intentions and behaviours of parents towards seeking child healthcare information online. Walsh et al. (2015) used hierarchical multiple regression to analyse the responses of 391 parents aged from 22 to 67; they found support for their model that combined risk perceptions with the TPB. From a health literature perspective, risk perceptions often refer to an individual's beliefs about how severe or how susceptible

they are to a health-related concern (Janz & Becker, 1984). Walsh et al. (2015), however, refer to 'Perceived Risk' as risks associated with the online information (such as health information that is not reputable, out of-date, or inaccurate) stating that higher quality of information would negate some risks associated with online information. The findings from this study showed that 68% of the variance in Intentions was accounted for by the TPB variables; the addition of 'perceived risk' added a further 2% to the variance explained. Further research was suggested to examine different aspects of 'perceived risk' in the form of information-related risks or concerns.

The explanatory power of the TPB and flexibility of the model to extensions has been illustrated in previous OHIS specific research. Further relevance of the TPB is also substantiated by its prior use in explaining behaviour and intentions in the health behaviour context. However, the TPB alone is not sufficient in explaining OHIS as there are various information- and system-related factors that inform the core beliefs in the TPB (e.g. attitude). As Bagozzi (1992) states of the TRA and TPB, the models maintain that "attitudes cause intentions, but they say nothing about the conditions under which they do so." (p. 184). Therefore, further investigation of the antecedent factors relating to OHIS attitude and intentions is necessary.

2.2.2. Technology Acceptance Model

The Technology Acceptance Model (TAM), shown in Figure 2, is an established IS model used to explain the adoption and usage of technology (Davis, 1989). Based on Ajzen and Fishbein's (1975) TRA, the TAM also posits that behaviour is predicted by behavioural intentions, which are in turn influenced by attitude (Taylor & Todd, 1995). Attitude is posited to be determined by two antecedents: 'Perceived Usefulness' and 'Perceived Ease of Use'. Perceived usefulness and ease of use perceptions are then influenced by system related features.

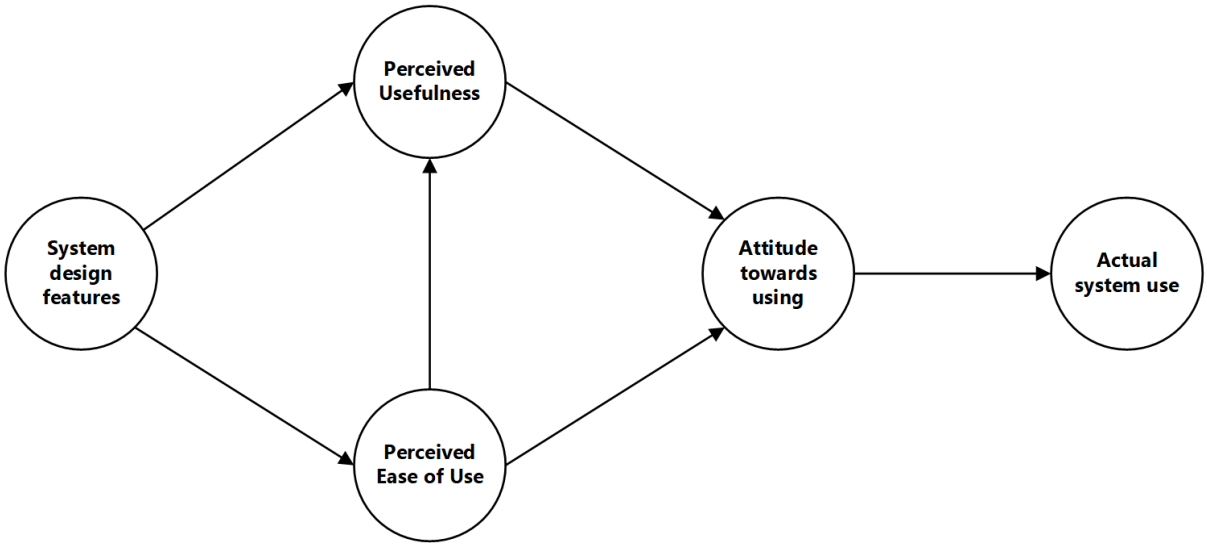


Figure 2. The Technology Acceptance Model. Reproduced from Davis (1993).

The concept of perceived usefulness refers to the degree to which an individual believes that using a particular system would enhance their performance, while perceived ease of use refers to the degree to which an individual believes that using a system would be free of effort (Davis, 1989). Perceived usefulness and perceived ease of use are closely related constructs. The link between perceived ease of use to perceived usefulness in the TAM suggests that perceived usefulness is influenced by ease of use perceptions, but not the reverse (Davis, 1989). This is because no matter how strongly an individual perceives a technology as easy to use, it is not a substitute for a technology that is not useful, whereas a sense of effortlessness could contribute to perceptions of usefulness.

1.1.1.2. The TAM in Research

The key concepts of the TAM have been successfully applied and extended in many IS research studies to explain adoption of technology in different contexts, such as with work-related technologies (Ketikidis, Dimitrovski, Lazuras, & Bath, 2012; Yi, Jackson, Park, & Probst, 2006), mobile banking (Lee, 2009; Tan & Teo, 2000), and online health information seeking (Chang & Im, 2014; Lim et al., 2011; Wong et al., 2014; Yun & Park, 2010).

In a study conducted by Wong et al. (2014), the core TAM model was used to predict OHIS amongst older Hong Kong Chinese adults. Using hierarchical regression analysis, the results from 98 questionnaires from adults aged between 55 to 91 were examined to assess the predictive ability of the TAM constructs. The constructs were found to explain 27% of the variance in behavioural intentions. Contrary to expectations, perceived usefulness (although correlated) was not a significant indicator of intention, whereas perceived ease of use was. They suggest this outcome to be a result of the sample participants' overall education level being lower, their lack of prior experience and also the older age of the sample (average age = 64.93). The factors combined would likely result in difficulties using the online system, rendering perceived ease of use to be a strong determinant for the older, less educated and less experienced demographic (Wong et al., 2014).

In a study on mobile health information seeking in Singapore that incorporated self-efficacy and prior experience with the TAM constructs, Lim, Xue, Yen, Chang, Chan, Tai, Duh and Choolani (2011) found prior experience to correlate with usefulness and ease of use perceptions. A two-part study was conducted across 164 participants between the ages of 21-62 (average age = 33.6). The first part consisted of a standalone survey, while in the second part participants completed the rest of the survey in regards to a web application (created for this study) provided on a mobile device. Results from the correlation and hierarchical regression analysis showed support for the TAM constructs, accounting for 37% of variance in intentions. They found that the addition of prior experience contributed to predicting intentions and indicated that prior mobile health information seeking would more likely result in positive evaluations of usefulness and ease of use. The addition of self-efficacy was also found to be

highly significant to predicting intentions, but rendered perceived ease of use insignificant. Lim et al. (2011) argue that if users are able to learn or assimilate to a technology quickly, thereby becoming more efficacious, ease of use becomes a lower concern in the intention to adopt a technology. Additionally, past use or exposure to a technology could also play a part in weakening ease of use perceptions as a determinant of intentions.

Other studies introduce health-related variables in an attempt to explain further variance in the OHIS process. For example, Yun and Park (2010) integrate the TAM with variables related to health beliefs to explore OHIS attitudes and intentions in South Korea. A total of 212 individuals over the age of 20 responded to their online questionnaire, where individuals eligible to participate were those who had sought health-related information in the past six months. Results from their structural equation analysis showed support for the TAM variable relationships, except for the ease of use perceptions to usefulness relationship. The variables, health consciousness, perceived risk, internet use efficacy and credibility were added, providing a good fit with the TAM model. Credibility perceptions were exceptionally important, shown to be a key factor influencing attitude and intention.

Chang and Im's (2014) study on OHIS intentions of older individuals in South Korea proposed the addition of several antecedent factors to perceptions of usefulness and ease of use. Three hundred participants aged 55 or older (average age = 70) completed a self administered questionnaire and structural equation modelling was used to analyse the fit of their research model. The TAM constructs were significant in predicting intentions to use the internet to seek health information. Additional significant factors included health relevance, computer self-efficacy, anxiety, enjoyment, and prior experience.

Similar to the TPB, the constructs in the TAM have displayed their strength in explaining intentions, but also extend on the antecedents of attitude from an IS usage perspective. Past OHIS research adapting the TAM has shown its openness to incorporating various systems and health behavior-related factors, and further supports the notion that the TAM can be adapted and integrated with additional concepts relevant to OHIS to improve its predictive ability. While the TAM has many strengths, accounting only for technology acceptance concepts can result in a reduced view of the information system-related factors in play.

2.2.3. User Satisfaction and Technology Acceptance Model

Wixom and Todd's (2005) theoretical model integrates technology acceptance concepts from Davis' (1989) TAM with quality and user satisfaction aspects from DeLone and McLean's (1992) IS Success model. As shown in Figure 3, this model introduces the idea that two key streams of IS research,

user satisfaction and technology acceptance, can work well together to provide a balanced view of the relationship between IS characteristics and system use.

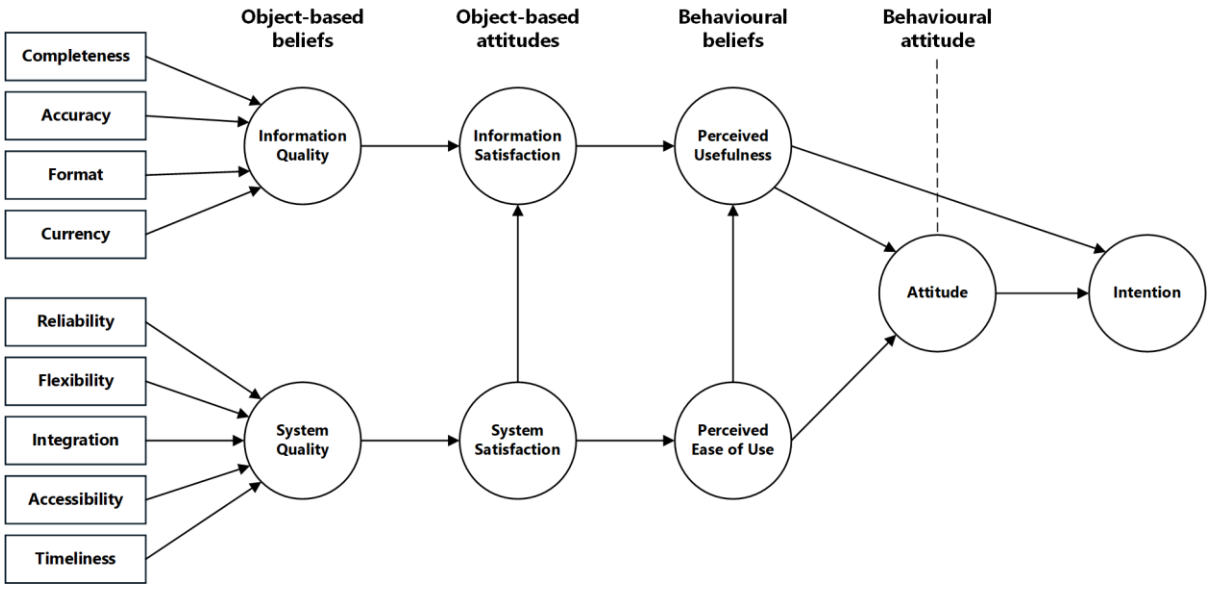


Figure 3. The User Satisfaction and Technology Acceptance Model (USTAM). Reproduced from Wixom and Todd (2005)

The right side of Figure 3 is Davis' (1989) TAM, which was discussed in detail in the previous section. The left side of the model is adapted from DeLone and McLean's (1992) IS Success Model, a fundamental theory in the user satisfaction research stream. It posits a relationship between information and system quality as antecedents to both user satisfaction and system use, which has contributed to understanding the importance of meeting user needs (Vaezi, Mills, Chin, & Zafar, 2016).

Information quality refers to the quality perceptions of the information produced by the system. This combines a range of judgements made by an individual, such as how accurate the information might be, how relevant it is to the individual, etc. (DeLone & McLean, 1992; Wixom & Todd, 2005). Closely tied to information quality, system quality refers to the performance perceptions of the system which produces the information (DeLone & McLean, 1992; Wixom & Todd, 2005). Information and system satisfaction refer to the sense of fulfilment provided by the IS. It is these perceptions that go on to shape beliefs about using the information and system (e.g. perceived usefulness and perceived ease of use) (Wixom & Todd, 2005).

Although the theory is not widely applied in OHIS research, the key constructs which underpin the model (e.g. information quality, system quality, satisfaction, intention, perceived usefulness) are relevant to OHIS. Therefore, these concepts are discussed further in the Sections 2.3.4. and 2.3.5.

1.1.1.3. Limitations of the IS Success Model and TAM

The importance of the concepts in the IS Success Model (DeLone & McLean, 1992) is that they provide indicators about an individual's beliefs and feelings towards the informational and system characteristics of an IS (i.e. satisfaction with the information and system aspects of the IS). However, Wixom and Todd (2005) suggest that the limitation of solely focusing on these characteristics and feelings to understand intention and use is that it conceptually skips from feelings about the information and system to behavioural performance, without explicitly considering the beliefs or feelings about the behaviour itself. Therefore, satisfaction itself is a limited predictor of use (Davis, Bagozzi, & Warshaw, 1989; Wixom & Todd, 2005). While quality and satisfaction assessments provide an indicator of feelings about the information and system, research suggests that these feelings are poor predictors of use (Kang & Lee, 2010; Wixom & Todd, 2005).

The incorporation of TAM concepts helps to bridge the gap (Wixom & Todd, 2005), by including beliefs (such as 'this is useful', 'this is easy to use') and feelings (such as 'this is beneficial', 'this is detrimental'). As mentioned in the previous section, Davis's (1989) TAM has been successfully applied and extended in many IS research studies to explain technology adoption in a range of different contexts, such as with work-related technologies, mobile banking, and online health information seeking. As a parsimonious model, the TAM identifies two key system characteristics (i.e. usefulness and ease of use) as key influencers in adoption and use, but does not indicate which elements of an IS (e.g. information/ system characteristics) lead to the perceptions of usefulness and ease of use. As Kang and Lee (2010) stated in regards to the conciseness of the TAM "it does not provide actionable feedback about important aspects of the IT artifact itself." (p. 354). Therefore, a limitation of the TAM is its inability to associate feelings regarding any distinct aspects of an information system to feelings about using the system.

Wixom and Todd's (2005) integration of TAM variables with quality and satisfaction concepts (Delone & McLean, 1992) to predict attitude and behavioural intention therefore provides a theoretical perspective which relates information- and system-related characteristics to system use. Finally, with the TAM aspect of the Wixom and Todd (2005b) model being based on the TRA, and also consistent with the TPB, both of the core concepts of subjective norms and perceived behavioural control can also be added to the base research model as antecedents to intention alongside attitude and perceived usefulness.

2.3. An Integrated Model of OHIS

The aforementioned models – the TRA, TPB and TAM – are established models on which many studies in health behaviour and information systems use are based. However, the concepts which the models are built upon are broad and general, and as a result there are limitations with applying them to specific fields. At the same time, the models are generic enough such that other concepts can be incorporated to provide a more context-relevant explanation of the target behaviours. Many studies have therefore extended the base models by integrating these with concepts from health, information systems and information seeking theories, to better explain OHIS (Kim & Park, 2012; Lim et al., 2011; Yoo & Robbins, 2008; Yun & Park, 2010). Due to the cross disciplinary nature of OHIS, a rich set of antecedents have been proposed by past research, including health status, literacy, website design features, perceived risk, demographic, past use, self-efficacy, credibility, quality and satisfaction (Eysenbach & Köhler, 2002; Hibbard & Cunningham, 2008; Lim et al., 2011; Rains & Karmikel, 2009; Reavley & Jorm, 2011; Sillence et al., 2007; Walsh et al., 2015; Yoo & Robbins, 2008).

As the aim of this study is to identify key aspects to better understand OHIS intentions, not all of the factors highlighted by prior research are included. The constructs selected, elaborated upon subsequently, have been recurrent in health behaviour and IS research, and their relevance to OHIS demonstrated through the support of prior literature. In particular, the literature has pointed to the relevance of past use, the PBC-related concept of self-efficacy, source credibility, information quality, system quality, information satisfaction and system satisfaction. The details for each of these are discussed in the following subsections.

2.3.1. Past Use

Past use refers to the extent that a behaviour performed previously would reflect future behaviour (Ajzen, 2002). Under stable conditions, individuals tend to favour behaviours that were frequently performed in the past as they can become a point of reference to some extent, thus affecting the formation of intentions (Ouellette & Wood, 1998). The argument that behaviours are highly determined by past behaviours has resulted in successful extensions of the TRA/TPB and TAM in the context of health behaviour and OHIS research (Chang & Im, 2014; Conner & Armitage, 1998; Lim et al., 2011; Ouellette & Wood, 1998; Van Der Rijt & Westerik, 2004; de Vries, et al., 1995; Yoo & Robbins, 2008).

In Gray, Klein, Noyce, Sesselberg and Cantrill's (2005) exploratory study on the OHIS behaviour of adolescents, 157 students (aged 11-19) in the UK and US participated in focus groups examining their perceptions and experiences with OHIS. The findings show that past experiences in seeking can establish usage patterns. For example, an individual could develop preferences for a

particular information provider or develop preferences for using OHIS as an alternative to relying on a health professional. This result suggests that their prior experience reflects the conduct of behaviour and can contribute to patterns of future behaviour. The information-seeking literature has also supported this notion, showing that users are likely to return to and consult the sources they have experienced prior success with or used in a previous, similar situation (Leckie, Pettigrew, & Sylvain, 1996).

Other empirical studies have also demonstrated the positive effect of past use to intentions. As detailed in Section 2.2.1.1, Yoo and Robbins' (2008) study of OHIS in middle-aged users in the US, which modelled OHIS using the TPB, found past experience to impact intentions to seek health information online. In support of this result are Lim et al.'s (2011) findings from their study of OHIS among Singaporean women. Referred to in Section 2.2.2.1, the findings revealed that the participants in the study referred to their past use experiences directly when forming intentions toward future OHIS. These findings indicate that past use of an online system to seek out health information establishes an impression on individuals, which in turn, reflects on decisions for future use (Bernhardt, McClain, & Parrott, 2004; Chang & Im, 2014; Lim et al., 2011; Taylor & Todd, 1995).

An important note regarding the application of past use to understanding OHIS is that contextual factors impacting an individual must remain relatively stable for past OHIS experiences to be indicative of conscious intentions or behaviour. Otherwise, a change in an individual's situation or motivations behind information seeking can lead to a change in intentions. For example, a diagnosis of a health issue or even a perception of vulnerability towards a health issue can result in OHIS (Eysenbach, 2003; Morahan-Martin, 2004). Therefore, it is conceivable that a change in the context and circumstances around OHIS can impact the relevance of past use. Nonetheless, the findings from prior literature has shown that with stability, individuals have turned to familiar methods for the purpose of satisfying similar needs, using their past information seeking experiences to inform their future decisions to seek health information online.

2.3.2. Self-efficacy

As a key aspect of PBC, self-efficacy has been used in place of PBC (as a proxy) when predicting use intentions (Bandura, 1977; Terry & O'Leary, 1995). Self-efficacy is defined as an individual's belief or opinion that they can successfully execute the behaviour required to produce the desired outcomes (Bandura, 1977; Fishbein & Ajzen, 2011). Self-efficacy beliefs are important because regardless of actual capabilities, an individual's perception of their capabilities tends to influence their choice of behavioural settings, affecting both the initiation and maintenance of behaviour (Bandura, 1977; Strecher, DeVellis, Becker, & Rosenstock, 1986).

Past research has indicated that individuals tend to fear or avoid situations and tasks that appear threatening or difficult. This means that individuals may not be willing to attempt an activity unless they perceive themselves as capable of completing the activity (Bandura, 1997; Case, Andrews, Johnson, & Allard, 2005; Orji, Vassileva, & Mandryk, 2012). The finding that individuals undertake tasks in regards to their own capability perceptions can be observed in Lim et al.'s (2011) study, which extends on the TAM with self-efficacy, as described in Section 2.2.2.1. The value of self-efficacy is that it uses an individual's judgement of their own skills, taking personal beliefs into account. To measure these beliefs, Lim et al.'s (2011) study questioned participants in regards to whether they felt they could use, or learn to use an technology to seek health information. Analysis of the responses revealed self-efficacy as a highly significant predictor of intentions, as users must first perceive themselves as capable before intending to engage in any OHIS.

Grounded in health information and technology use, de Veer, Peeters, Brabers, Schellevis, Rademakers and Francke's (2015) study of determinants to use online health sources showed that an individual's capability perceptions were highly important. A total of 1014 survey responses from Dutch respondents aged between 57-77 were analysed using descriptive statistics and nested linear regression analysis. The results showed that belief in one's own internet skill was a key factor impacting intentions to use online health, and is associated with perceptions such as 'how easy or difficult it was perceived to be' (e.g. using internet for online health) or 'how easy it would be to learn'. This conclusion was also supported by other studies with older demographics, as they were less likely to be familiar with technology or online systems, and more positively inclined towards achievable, lower effort technology endeavours (de Veer et al., 2015; Wong et al., 2014). Another study by Kim and Park (2012) focused on understanding consumer use intentions towards using health information technology. Using 728 questionnaire responses from South Koreans (aged 19-60), the structural equation analysis revealed self-efficacy to be a significant factor influencing perceived usefulness, perceived ease of use and intentions. These results demonstrated that an individual's confidence in their ability to use health information technologies had a flow on effect on foreseeable benefits from use, ultimately increasing their inclinations to use health information technologies.

Other studies have not had the same success with using self-efficacy measures in their research. For example, Huurne and Gutteling (2008) examined online hazard information seeking in a random selection of 1042 Dutch residents, and found self-efficacy to be insignificant to future intentions to hazard information seeking. In contexts where the measured behaviour is voluntary, such as hazard information seeking among an arbitrary selection of users or self-regulated learning, it is conceivable that efficacy perceptions may not have that much relevance to an individual's intentions, as the context itself brings forward the questions of whether the individual must, is capable of, or even wants to carry out the behaviour (Blumenfeld, Pintrich, Meece, & Wessels, 1982; Huurne & Gutteling, 2008; Pintrich

& De Groot, 1990). This result is in essence summarised by Eagly and Chaiken (1993), who state that the notion that individuals feel capable of carrying out an action does not imply intent. Thus, self-efficacy concepts are also tied with an individual's best interests and their feelings towards the behaviour. Based on the findings of prior literature, self-efficacy appears to be an important factor in understanding the OHIS process, under the assumption that the decision to seek information aligns with their interests.

2.3.3. Source Credibility

The concept of credibility is a critical element in consumer psychology, often emphasised in communication, marketing and media research where information factors and information transfer are key elements (Grewal, Gotlieb, & Marmorstein, 1994a; Milburn, 1991). Source credibility refers to an individual's perception that the information source holds expertise and is trustworthy, providing correct information without bias (Cheung, Sia, & Kuan, 2012; Cheung, Luo, Sia, & Chen, 2009; Ibelema & Powell, 2001; Milburn, 1991). This means that the more credible a source is perceived to be, the more legitimate, unbiased, and trustworthy the source appears to the individual. Not to be confused with information quality discussed in the Section 2.3.4 , source credibility refers to the qualities of the content author, while information quality focuses on the assessment of the content itself (Hilligoss & Rieh, 2008).

Recognised in the information seeking literature, early models have focused on different aspects of source credibility. Leckie, Pettigrew and Sylvain (1996) noted the importance of source factors with emphasis on trustworthiness - a key dimension of credibility. Similarly, Johnson et al. (1997) and Wilson (1997) also cite credibility as one of the key information source characteristics (Robson & Robinson, 2013a). The relevance of source credibility in the context of online health information literature can be exemplified by the vast amounts of unregulated online information available that is published without basic source information. Individuals can access health-related information from credible scientific institutes or, just as easily, access unregulated information from sources of unknown credibility, which makes it difficult for individuals to differentiate between what is and is not trustworthy (Brown, Roufogalis, & Williamson, 2009; Cline & Haynes, 2001; Greer, 2003; Lindberg & Humphreys, 1998). As Yun and Park (2010) state in regards to trust, accuracy, currency and authority perceptions, credibility is a priority for the health information seekers as their seeking is purposeful and not frivolous in nature. While online health information leads in accessibility, it lacks credibility, and this is one of the primary reasons health practitioners remain a preferred source of health-related information (Dutta-Bergman, 2003; D. Johnson & Meischke, 1991; Sweet, Perrier, Podzyhun, & Latimer-Cheung, 2013; Yan, 2010).

In a qualitative study by Eysenbach and Köhler (2002b) looking at how users seek and appraise online health information, it was found that trust, expertise and bias were salient concerns for information seekers. A series of interviews were conducted among 21 participants aged between 19-71, to identify their needs, expectations and issues regarding online health information. Participants in the study stated that they would trust information more if it were from a public or scientific institution rather than private sites. Information provided by a public institution were perceived as less prone to bias, as individuals expect public agencies to act in a honest, socially responsible manner, while information provided by scientific institutions are assumed to be provided by sources with expertise. It was also important to the participants to know whether the information was from one individual or an institution, and whether the content was selected according to scientific criteria, which also reflected the individuals' previous judgements of bias, expertise and trustworthiness (Deng, Liu, & Hinz, 2015; Eysenbach & Köhler, 2002).

Eysenbach and Köhler's (2002b) results were further supported by Sillence et al. (2007c), who found that individuals will disregard health information from sources perceived as less trustworthy or showing bias and selected 'expert' sources. The observational study involved 15 women aged between 41-60, participating in four two-hour sessions of online health information seeking and group discussions over a nine month period. The examination of how users evaluate and make use of online health information showed that users quickly generated and rejected many results in their OHIS sessions, such as sites that showed overt displays of advertising material or had a corporate feel. Those features made the sites seem like they had a commercial agenda and were thus biased and less trustworthy, whereas the most preferred sources were those that had an expert or medical feel as they were perceived as trustworthy.

Overall, the findings of prior research show that source credibility is a prominent concern when seeking health information online and is consequently a highly relevant and significant factor of OHIS. Moreover, individuals were found to be drawn to sources they perceived as credible.

2.3.4. Quality

Information quality refers to the quality perceptions of the information produced by the system. This combines a range of judgements made by an individual (DeLone & McLean, 1992; Wixom & Todd, 2005). System quality refers to the performance perceptions of the system which produces the information (DeLone & McLean, 1992; Wixom & Todd, 2005). System and information quality are distinct concepts, but researchers will often treat the information and system as one, or overlook system-related factors all together.

Information Quality

Research in information sciences and health information studies have consistently expressed the importance of information quality in understanding consumer information interactions, and in parallel, the quality of online health information remains an ongoing topic of discussion (Eysenbach & Köhler, 2002; Gillaspy, 2005; McClung, Murray, & Heitlinger, 1998; Morahan-Martin, 2004).

In Deng, Liu and Hinz's (2015) study of OHIS behaviours through mobile devices by Chinese consumers, 259 individuals between the ages of 18-60 completed a survey when they visited their hospital for a physical examination or to see their doctor for a non-serious health reason. The results from the regression analyses showed information quality perceptions to have a great effect on OHIS, such that when a user perceives the information quality of online sites to be high, they are more likely to seek information from these sites. In agreement, Sillence et al. (2007c) assert that information quality perceptions are crucial, stating that individuals will incorporate health information they perceive as high quality into their everyday life as knowledge. Individuals will seek and use information to make health-related decisions, from deciding to visit a health professional or to seek further information. This illustrates the importance and impact of information quality perceptions in the OHIS process.

Moreover, researchers have uncovered various information quality-related criteria that seekers use to assess online health information, further demonstrating information quality's pertinence to OHIS. For example, some seekers have assessed information quality based on relevancy (if the content fit what the individual was seeking), accuracy (if the information appears to be as good as their doctor's advice), comprehensiveness, (if the content described their health-related topic thoroughly), currency (if the information is up-to-date), and more (Berland et al., 2001; Christian, Kieffer, & Leonard, 2001a; Eysenbach & Köhler, 2002; Gillaspy, 2005; Gray et al., 2005; Morahan-Martin, 2004; Rains & Karmikel, 2009; Walsh et al., 2015).

System Quality

Individuals usually have an abundance of choices when it comes to online health information systems. Studies in OHIS have shown that when an individual is interacting with a system, they make an assessment of OHIS based on different system characteristics, such as judgements on the design, layout, search functions or navigation. These various system quality characteristics can either enhance the delivery of information or repel users as they trawl through poor quality site after site (Cline & Haynes, 2001; Sillence et al., 2007). For example, if an individual is seeking information about a health condition and the system returns unrelated information, the individual may feel that the system itself is substandard and does not function properly, assuming that a substandard system will likely result in substandard information output (Gorla, Somers, & Wong, 2010). Therefore in this situation, the ability

for a system to provide valid and relevant links to an individual's health information query would contribute to positive judgements of system quality (Cline & Haynes, 2001).

Unlike information quality perceptions, relatively consistent system quality perceptions have been observed for health information experts and non-experts alike (Kim, Park, & Bozeman, 2011). Despite the fact that there is often consensus between the regular user and health professionals, past research has indicated that individuals are critical with their system quality assessments. Individuals may rate a 'boring' system lower due to its lack of interaction or playfulness, but they may also rate these systems down for opposite reasons (Kim et al., 2011; Sillence et al., 2007). Kim et al. (2011) observed, in a study of individuals evaluating online health information systems, that an abundance of interactive, flashy features were diminishing to perceptions of quality because it made it more difficult and confusing to access information. This showed the relevance of system quality perceptions and the evaluative nature of online health information seekers.

Information and system components are inseparable aspects of an information system and vital to the OHIS process. However, despite being closely linked, they are still distinct concepts that can be treated and evaluated separately. System quality assessments appear salient to OHIS and relatively consistent among users holding different levels of health expertise, while assessments of information quality are disparate between the regular health information seeker and health professionals (Kim et al., 2011). Health information researchers and health professionals have communicated their concern on the varying quality of health-related information online, but actual quality and perceived quality can be very different matters of discussion (Eysenbach, Powell, Kuss, & Sa, 2002; Kim et al., 2011; Morahan-Martin, 2004; Walsh et al., 2015). It is unclear to what extent a lay person's assessment of the online health information and system influences their information seeking process. Therefore, it is important to observe the role of both information and system quality perceptions in the context of OHIS.

2.3.5. Satisfaction

Satisfaction can be described as an individual's judgement that a product or service provides a pleasurable level of fulfilment (Oliver, 2010). Information satisfaction would mean that an individual feels satisfied with the online information which matches their needs, while system satisfaction means that the system has performed in a manner conducive to their OHIS process.

Information Satisfaction

Individuals seek information for a purpose, for example, for health-related decision making or to prepare for a visit to a health professional (Nettleton et al., 2005; Sillence et al., 2007). Information satisfaction is important in the context of OHIS because it can also reflect a lot about the current state

of offline health information seeking and indicate whether or not OHIS meets the needs that may have been previously filled by other sources. Many individuals do not choose to follow up to confirm the health information obtained during their OHIS sessions and felt sufficiently informed from OHIS (Fox & Duggan, 2013; Morahan-Martin, 2004). Studies also show that individuals have explicitly expressed satisfaction of their information needs in their evaluations of OHIS activities (Kim et al., 2011). Here, these individuals were able to answer to their information needs from OHIS and accordingly, showed how satisfaction with the information received meant that they perceived OHIS to be adequate in fulfilling their health information needs (Kim et al, 2011; Morahan-Martin, 2004). Therefore, a measure of their satisfaction with the online health information indicated whether their purpose has been met. OHIS research should not only reflect whether or not an information output was retrieved, but also whether or not an individual was content with their information output. After all, dissatisfaction with offline health information has also been found to be a key motivator of online health information seeking (Morahan-Martin, 2004).

System Satisfaction

System satisfaction perceptions give an indication of an individual's feelings about the system and provide a useful base for IS characteristics, such as IS quality (Wixom & Todd, 2005). In an online environment the information and system cannot exist independently, as with the information and system quality perceptions, information and system satisfaction perceptions are also closely related. For example, dissatisfaction with a web site could mean that an individual is more likely to leave the site even if the information would have been relevant to their needs (McKinney, Yoon, & Zahedi, 2002). This is also noted by Sillence et al. (2007c) where individuals who felt discontent about a system would disregard information from the system, regardless of the information's own merit.

Thus, information and system satisfaction perceptions appear to be closely tied concepts that play an important role in influencing OHIS. Taking account of satisfaction helps determine the effect of feelings about the information and system components in the OHIS process.

2.4. Literature Gaps

Current research in health information seeking has shown a recognition of the importance of IS related concepts when explaining the OHIS process. However, IS-related factors are an inadequately explored aspect of online health information seeking literature. While the TPB (Ajzen, 1991a) provides a general understanding of antecedents to behavioural intentions, it does not explain how these belief systems are formed and relies on complementary theories to account for these explanations – one of these theories extending on these belief systems is the TAM (Davis, 1989a). Despite recognising the need to account for IS related concepts in the health information seeking process, the inclusion of IS

concepts in current research is limited, if included, and IS theory inclusion is often limited to the TAM. Although both the TPB and TAM are significant theories that have contributed to understanding of OHIS, there are limitations with applying these broad theories in a specific context. As a result, researchers have extended these models, contextualising the models with salient concepts identified from literature. This has resulted in inconsistencies with the concepts selected, relationships proposed and produced mixed findings.

There is a wealth of existing research suggesting salient concepts of OHIS, including source credibility, information quality, system quality, information satisfaction, system satisfaction, self-efficacy, and past use (Bliemel & Hassanein, 2007; de Veer et al., 2015; Deng, Liu, & Hinz, 2015; Eysenbach & Köhler, 2002; Sillence et al., 2007; Yoo & Robbins, 2008), that can be used to enhance our understanding of intentions to use online systems to seek health information. However, a gap in the literature exists as little attention has been given to combining these factors, which is necessary to understand the impact of these different factors on OHIS intentions. In particular, IS-related factors are crucial components of the technology environment that individuals use to seek health information. It is not enough that these factors are identified; rather modelling and further examination of these factors is essential to understand the role and relative impact of IS-specific components in the formation of intentions. Understanding the impact of the IS characteristics and the factors that relate to satisfying the information seeker, subsequently leading to intentions to use, is important for researchers, as well as public and private organisations that aim to develop, and provide individuals with online systems that provide health-related information.

As online channels for health information seeking become increasingly popular, it is valuable to consider the impact of IS components in online health information research. This research will contribute to the health information literature by extending on the social psychological and IS aspects of focusing on the extension of IS factors that impact OHIS. An exploration of OHIS from an IS perspective would provide insight into the information and system components of the technological environment, and also contribute to a better understanding of the factors that impact an individual's intentions to seek health information using an online system. Wixom and Todd's (2005a) User Satisfaction and Technology Acceptance Model was identified as a useful IS theory to help address these identified gaps and provide a structural framework into which other concepts can be incorporated.

Research Model and Hypotheses Development

This chapter introduces the proposed research model and the hypothesised relationships between the model constructs. The research hypotheses will be formed based on prior literature and established theoretical relationships. A summary of the hypotheses are presented in Table 1.

3.1. Research Model Formation

The literature reviewed has uncovered key theory and salient concepts of OHIS with an IS focus. The TPB and TAM are two well established theories that have been used to explain various health behaviours, including OHIS, but there are limitations with modelling OHIS intentions with these theories alone as they are broad and general. Furthermore, there are other salient concepts of OHIS. Using Wixom and Todd's (2005) User Satisfaction and Technology Acceptance Model (USTAM) as a framework, which is based on the IS Success model and TAM, the theoretical model (Integrated Model of OHIS) aims to extend on the salient concepts of health information seeking using online systems into one cohesive model. The theoretical model proposes that IS-related factors from the technological environment (e.g. information quality, system quality, etc.) are important influences of OHIS intentions, and uses the TPB to explain the social psychology aspects of health information seeking behaviour (e.g. attitude, social influences, etc.).

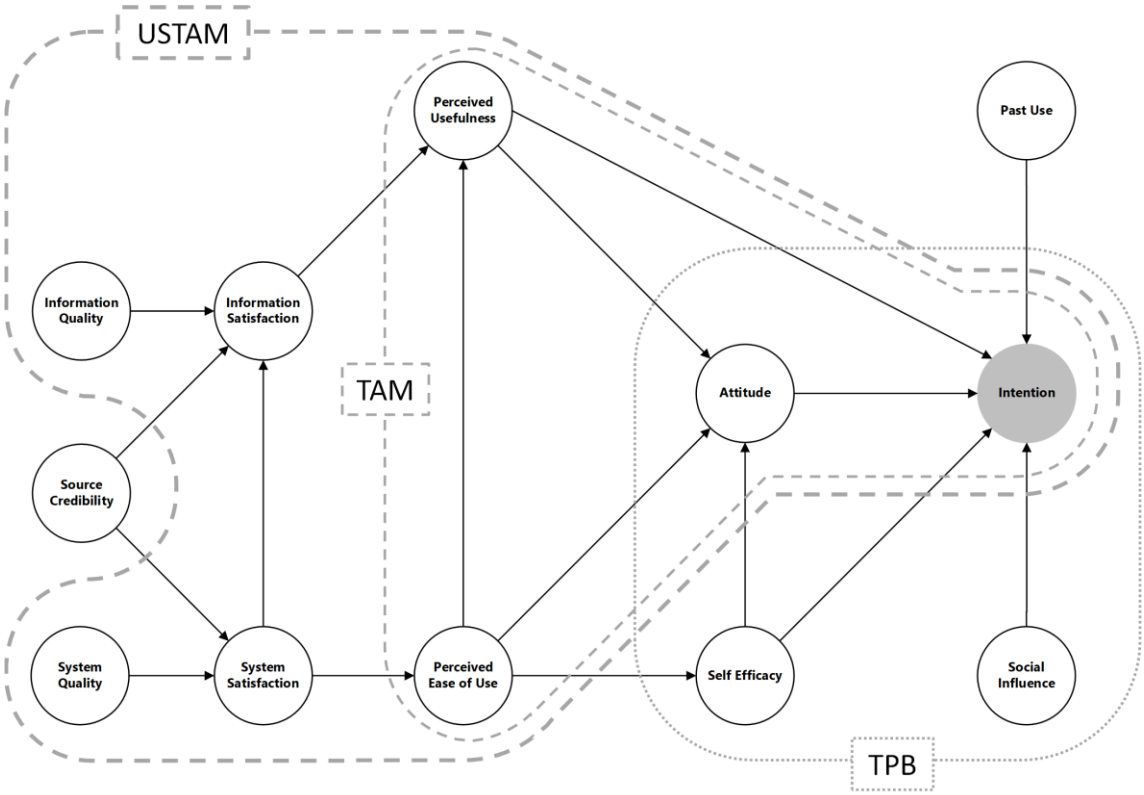


Figure 4. Integrated Model of OHIS.

3.2. Hypothesis Development

3.2.1. Source Credibility

Source credibility refers to an individual's belief that the information provided comes from an unbiased, trustworthy source (Cheung et al., 2012; Hilligoss & Rieh, 2008). It is not concerned with the information content itself, but with the credibility of the source of the information (Cheung et al., 2012). Source credibility is therefore a characteristic of the source of the information, and not of the information itself (as is the case with other information characteristics such as accuracy and reliability). Focusing on the source, it would be expected that people who believe that information is provided by a credible source are likely to be more accepting of that information (Cheung et al., 2012; Cheung, Luo, Sia, & Chen, 2009). In this study, the relationship between source credibility and information satisfaction refers to the extent to which an individual's perceived credibility of a source influences their satisfaction with the online health information provided.

Online health information seekers commonly seek information when they experience uncertainty or have an information need; often the source of information is used to judge its credibility when individuals are faced with unfamiliar information. As a result individuals will more readily accept information from a source that is perceived as highly credible (Eastin, 2001; Grewal, Gotlieb, & Marmorstein, 1994b). For example, in a study focusing on the appraisal of online health information, credible sources have been identified as public or scientific institutions (Eysenbach & Köhler, 2002). Individuals were more content with information from public institutions as they were believed to have a duty to act in an unbiased manner, while scientific institutions often have a medical feel that produces a sense of expertise (Eysenbach & Köhler, 2002). Overall, the preference for institutions as an information source is due to the perception that information provided by a group is more trustworthy than what is provided by one individual (Eysenbach & Köhler, 2002; Sillence et al., 2007). Given that an individual is more likely to be satisfied with information from a source they perceive as credible, the following hypothesis is proposed:

H1a: Source credibility is positively related to satisfaction with online health information.

The relationship between source credibility and system satisfaction refers to the degree to which an individual's perceived credibility of a source influences their satisfaction with the technical system (e.g. website, app) that provides the information.

As mentioned in the section above, individuals are more likely to be content with information that is perceived as credible. This also applies to system satisfaction, suggesting that positive perceptions of source credibility (i.e. the credibility of online health information providers) encourages

beliefs that the system that provides the information will also perform in a manner that is conducive to the online health information seeking process. For example, individuals have been found to be more content with health information websites or applications provided by credible authorities (Eysenbach & Köhler, 2002; Sillence et al., 2007). Therefore, if an individual trusts and believes that a source of information is credible, then the individual is more likely to be satisfied with the system which provides access to information from the credible source:

H1b: Source credibility is positively related to satisfaction with online systems.

3.2.2. Information Factors

Information quality refers to the quality perceptions about the information produced by a system (DeLone & McLean, 1992). In this study, the relationship between information quality and information satisfaction refers to the degree to which an individual's perceived quality of the information provided influences their sense of satisfaction with online health information.

The relationship between information quality and information satisfaction is supported by theories such as DeLone and McLean's (1992) IS Success Model and Wixom and Todd's (2005) integration of user satisfaction and technology acceptance concepts. Prior research based on DeLone and McLean's (1992) IS Success Model provides support for a relationship between information quality and information satisfaction in contexts such as e-learning, online shopping and other online services (Kang & Lee, 2010; McGill, Hobbs, & Klobas, 2003; Rai, Lang, & Welker, 2002; Roca, Chiu, & Martínez, 2006).

The quality of online health information is a salient concern of information seekers. Individuals can quickly reject online health information they perceive as low quality (i.e. appears inaccurate or non-evidence-based/unreliable) or willingly accept information into their everyday lives as knowledge (Deng, Liu, & Hinz, 2015; Eysenbach, 2003; Sillence et al., 2007). Morahan-Martin (2004) found that some individuals perceived the quality of online health information to be akin to the quality of information from a health practitioner. As a result those individuals felt that seeking health information online only was sufficient to their needs. Additionally, in a statistical study of over 3,000 individuals who used an online system to seek health information, 46% of the respondents did not follow up with a health professional to confirm their findings (Fox & Duggan, 2013), suggesting that they perceived the information provided online to be sufficient for their needs. In the OHIS context, information satisfaction means that the individual's information need has been fulfilled by the online health information. This is supported by Bliemel and Hassanein's (2007) study which found an individual's assessment of information quality to influence their level of satisfaction. Therefore, the following hypothesis is proposed:

H2a: Information quality is positively related to satisfaction with online health information.

The relationship between information satisfaction and perceived usefulness has been demonstrated by Wixom and Todd's (2005) integrated model of user satisfaction and technology acceptance, and supported by studies in various contexts ranging from administration to online services (Forsgren, Durcikova, Clay, & Wang, 2016; Kang & Lee, 2010). It refers to the degree to which an individual's sense of satisfaction received from information influences how useful they perceive the system to be.

Perceptions of usefulness in this context suggest that the individual perceives there is value and utility to be gained by using an online system to seek health information. Individuals seek health information online to fulfil an information need; if the information sought has relevance in satisfying these needs then it can be suggested that the individual would perceive utility and usefulness in OHIS (Robson & Robinson, 2013). This leads to the following hypothesis:

H2b: Information satisfaction is positively related to the perceived usefulness of using online systems to seek health-related information.

3.2.3. System Factors

System quality is an assessment of system-related characteristics, that is, the technology (e.g. website, app) that supports the delivery of information. The relationship between system quality and system satisfaction refers to the degree to which an individual's perceived quality of the system influences their sense of satisfaction towards the system. Key theories supporting this relationship include DeLone and McLean's (1992) IS Success Model and Wixom and Todd's (2005) integration of user satisfaction and technology acceptance.

Wixom and Todd (2005) state that system quality beliefs are pertinent in shaping an individual's sense of satisfaction towards the system. This view is supported by Bai, Law and Wen (2008), Bliemel and Hassanein (2007), Roca et al. (2006) and Rodgers, Negash and Suk (2005) who have all found system quality to be positively related to system satisfaction in the contexts of online learning, online health information seeking and electronic commerce services. Bliemel and Hassanein (2007) even suggested that system quality factors (e.g. design and usability) should receive more attention due to its strong influence on satisfaction. These findings lead to the following hypothesis:

H3a: System quality is positively related to satisfaction with online systems.

System satisfaction refers to an object-based attitude, that is, an individual's feelings towards the system and its interaction mechanisms (Wixom & Todd, 2005). In this study, the relationship

between system satisfaction and information satisfaction refers to the degree to which an individual's satisfaction with the technical system that supports an online health information system influences their satisfaction with the health information that is provided by the system.

Information satisfaction and system satisfaction have at times been grouped together and evaluated as a single construct (e.g. Roca et al.'s (2006) research into electronic learning services extending the TAM) as they tend to be closely aligned (Kang & Lee, 2010; Wixom & Todd, 2005). This relationship between system satisfaction and information satisfaction is closely connected because the information that is provided by a technical system can be viewed as an extension of the technology, which acts as a delivery mechanism of health information to online health information seekers. After all, individuals have been noted to disregard information for reasons that are unrelated to the information itself, but are instead due to dissatisfaction with the technology itself (e.g. not enjoyable to use, is boring, is slow) (Sillence et al., 2007). Accordingly, it is proposed that an individual's perceived satisfaction with the technical system affects their satisfaction with the information provided by the system. This leads to the following hypothesis:

H3b: System satisfaction is positively related to satisfaction with online health information.

In this study, the relationship between system satisfaction and perceived ease of use refers to the degree to which an individual's satisfaction with the system influences their perception of the system as easy to use. Wixom and Todd's (2005) study integrating user satisfaction with technology acceptance empirically validated the impact of system satisfaction on ease of use perceptions. This positive association was an important observation of Wixom and Todd's (2005) study as it demonstrated support for the integration between IS satisfaction concepts and Technology Acceptance beliefs. This association is also supported by Cody-Allen and Kishore's (2006) and Min, Ji and Qu's (2008) theoretical extension of Venkatesh, Morris, Davis and Davis's (2003) UTAUT to include system satisfaction as an antecedent of 'effort expectancy'. This leads to the following hypothesis:

H3c: System satisfaction is positively related to the perceived ease of use of using online systems to seek health-related information.

3.2.4. Perceived Ease of Use

Prominently presented in Davis' (1989) TAM, it is expected that ease of use perceptions operate through usefulness perceptions. This is because an easy to use system facilitates the purpose of using a system, whereas perceptions that a system is difficult to use can hinder the individual from achieving their original purpose for using the system, negatively impacting their beliefs that the system in useful. In this study, the relationship between perceived ease of use and perceived usefulness refers to the

degree to which an individual's perception of the system (e.g. website, app) as easy to use influences how useful they perceive the system to be for online health information seeking.

Prior research supporting this relationship include studies of online learning (Hsu & Chiu, 2004), online banking (Lee, 2009), online shopping (Crespo, del Bosque, & de los Salmones Sánchez, 2009) and OHIS (Kim & Park, 2012; Wong et al., 2014). For example, in Wong et al.'s (2014) study on OHIS by older adults, ease of use showed a strong correlation to usefulness when assessing system use. Ease of use was a prominent concern for these older individuals who were not particularly familiar with engaging in OHIS behaviours. This suggests that it would not matter if the system was actually useful if it was perceived as too laborious to use. Therefore, it is proposed that if an individual perceives a system as easy to use, this perception is conducive to how useful they feel the system is. This leads to the following hypothesis:

H4a: Perceived ease of use is positively related to the perceived usefulness of using online systems to seek health-related information.

Davis' (1989) TAM also proposes an association between perceived ease of use and attitude. The relationship between perceived ease of use and attitude refers to the degree to which an individual's perception of a system as easy to use influences their sense of favourability towards health information seeking using the online system.

Studies of various online service settings have also supported this relationship; these include studies of online shopping (Crespo et al., 2009), online learning (Park, 2009) and OHIS (Kim & Park, 2012; Yun & Park, 2010). In both Yun and Park's (2010) and Kim and Park's (2012) research into consumer health information seeking behaviours online, ease of use was found to have a positive effect on attitude. Crespo et al.'s (2009) research into online shopping found a significant relationship between ease of use and attitude for individuals who currently engage in online shopping which suggests that a positive assessment of the effort required to use a system is necessary for an individual to engage in a behaviour. This finding is pertinent to this study as it suggests that for individuals who intend to seek health information online, perceptions of an online health information system as easy to use is an important factor influencing their attitude towards online health information seeking. The following hypothesis is proposed:

H4b: Perceived ease of use is positively related to attitude towards using online systems to seek health-related information.

Self-efficacy refers to an individual's belief about their capabilities to perform context specific behaviours (Bandura, 1977; de Vries, Dijkstra, & Kuhlman, 1988). The relationship between ease of use and self-efficacy in this study refers to the degree to which an individual's perception of a system

as easy to use influences their perceptions of their own capabilities to seek health information using the online system.

Bandura (1997) suggests that the positive aspects of past interactions can relate to a higher self-efficacy. As ease of use perceptions are a behavioural belief that is elicited from the use of an object, this belief may tie into an individual's interaction with using the system (Eagly & Chaiken, 1993; Wixom & Todd, 2005). Similar concepts related to the role of 'ease of use' in the system interaction process are also key ideas in self-efficacy, such as mastery and confidence. For example, successes with a behavior raise mastery perceptions, while failures lower these perceptions (Bandura, 1977). Therefore, finding a system easy to use could affect an individual's perception of their capabilities to use the system. If an individual perceives that seeking health information using an online system is easy (such that they expect to experience success), they will likely perceive themselves as competent in using the system (so experience increased feelings of mastery and confidence).

OHIS studies have also evaluated capability perceptions in terms of whether an individual feels they could learn to perform a behaviour (de Veer et al., 2015; Lim et al., 2011). Therefore, if an individual perceives the system as easy to use, they are more likely to perceive themselves as capable of using or learning to use the online system to seek health information. This leads to the following hypothesis:

H4c: Perceived ease of use is positively related to self-efficacy regarding use of online systems to seek health-related information.

3.2.5. Perceived Usefulness

Perceptions that a system is useful means that an individual believes that using the system would enhance their performance of a behaviour (Davis, 1989). In this study the relationship between perceived usefulness and attitude refers to the degree to which an individual's perception of a system as useful influences their sense of favourability towards health information seeking using an online system.

Research on the factors influencing online health information seeking behaviour have indicated that usefulness perceptions have an influence on the attitude assessments made by an individual (Chang & Im, 2014; Kim & Park, 2012; Yun & Park, 2010). The findings from Chang and Im's (2014) study of OHIS behaviours among older adults suggested that the perception of online systems as a convenient medium for health information seeking is positively associated with willingness and favourability toward using online systems.

Usefulness perceptions have also been found to be a significant influence on attitude in studies on the adoption of a number of different online services (Crespo et al., 2009; Hsu & Chiu, 2004; Park, 2009). For example, Crespo et al. (2009) found that perceived usefulness was significant in relation to the attitude of individuals who did not engage in online shopping and also for those who did. This finding suggests that regardless of an individual's level of participation in a behaviour, their perception that a system assists in the performance of a behaviour can lead to positive evaluations of using the system to perform the behaviour. These findings lead to the following hypothesis:

H5a: Perceived usefulness is positively related to attitude towards using online systems to seek health-related information.

The relationship between perceived usefulness and intention refers to the degree to which an individual's perception of a system as useful influences their intentions to use the system to seek health information online. The relationship between usefulness and intention has received considerable support from prior research; this is suggested to be due to an individual's belief in the use-performance relationship (Agarwal & Karahanna, 2000; Davis et al., 1989; Taylor & Todd, 1995). For example, empirical research focusing on software adoption (Hsu, Wang, & Chiu, 2009), online banking (Lee, 2009; Tan & Teo, 2000), and OHIS (Chang & Im, 2014; Deng et al., ; de Veer et al., 2015; Kim & Park, 2012; Lim et al., 2011) have observed a connection between perceptions that using a technology or system will improve performance and future intentions to use the technology or system. Similarly, De Veer et al.'s (2015) study on the adoption of online health systems by older individuals found that individuals who did not find or believe the system to be useful would be less inclined to use these online systems for health information. At the same time, some studies suggest that with experience, as in the case of post-adoption use, perceived usefulness may not have a significant impact on intentions (Park, 2009; Yuen & Ma, 2008). Nonetheless, since most studies show perceived usefulness to impact intentions, it is expected that a user would form intentions to use a system based on their perceptions of whether using the system would improve their performance, and that these perceptions would have a significant impact on intention. This leads to the following hypothesis:

H5b: Perceived usefulness is positively related to intention to use online systems to seek health-related information.

3.2.6. Social influence

Social influence refers to the sense of pressure that an individual experiences to carry out a behaviour (Fishbein & Ajzen, 2011b). In this study context, the relationship between social influence and intention refers to the degree of influence that an individual's peers or other referent persons have in relation to the individual's intentions to seek health information online.

This is a key relationship in both the TRA (Fishbein & Ajzen, 1975b) and the TPB (Ajzen, 1991). Fishbein and Ajzen (2011b) suggest that an individual's intentions to perform a behaviour correspondingly increases with the social pressures experienced. Social influence plays an important role in OHIS as many information behaviours do not occur in isolation of other individuals (Hargittai & Hinnant, 2006). This relationship between social influence and behaviours is shown in a study of health information needs and perceptions conducted by de Vries et al. (2005). The study showed that intentions or 'openness' towards seeking health information were higher in individuals who reported experiencing more positive social endorsement from a range of influences, such as their partner, colleagues, and even their general practitioner. For example, a mismatch between the health behaviours and/or intentions of two or more people (i.e. an individual intends to engage in OHIS, but their partner or colleagues avoid engagement or discussion) can inhibit intentions to seek health information online (Lambert & Loiselle, 2007). These findings lead to the following hypothesis:

H6: Social influence is positively related to intentions to use online systems to seek health-related information.

3.2.7. Self-efficacy

Self-efficacy and attitude are two concepts that are often presented together in theories that seek to explain behaviour and motivation processes, such as in the TPB (Ajzen, 1991), ASE Model (de Vries et al., 1988), and the Health Belief Model (Rosenstock, Strecher, & Becker, 1988). The relationship between self-efficacy and attitude is also supported by Social Cognitive Theory (Bandura, 1986). In this study, the relationship between self-efficacy and attitude refers to the degree to which an individual's perception of their own capabilities influences their sense of favourability towards the behaviour of seeking health information online.

Higher self-efficacy perceptions tend to link behaviours to positive psychological factors, while a lower sense of self-efficacy can be linked to the formation of negative psychological factors such as fear (Bandura, 1986; Maddux & Rogers, 1983). This means that the more an individual perceives themselves as capable of carrying out a behaviour, the more likely they are to view the action of carrying out the behaviour positively.

This relationship between self-efficacy and attitude has been supported in the information systems (IS) literature. For example, Compeau and Higgins (1995) in a study of individuals' competency beliefs in computer use found self-efficacy to be an important antecedent of attitude. Similarly, Hsu and Chiu (2004) found self-efficacy to influence attitude, in a study investigating the acceptance of e-services. Kim and Park's (2012) study of consumer health information seeking showed that an individual's sense of confidence in their ability to use the online health information system

influenced their perception of benefits from use. These findings support the expectation of an influence of self-efficacy on attitude. Therefore, the following hypothesis is proposed:

H7a: Self-efficacy is positively related to attitude towards using online systems to seek health-related information.

The relationship between self-efficacy and intention in this study refers to the degree to which an individual's perception of their own capabilities influences their intentions to seek health information using the online system. Prior research has argued that motivation to perform behaviour can be restricted by self-efficacy, as self-efficacy can influence the decision-making process concerning which behaviours to undertake (Bandura, 1977; de Vries, Mesters, & Van de Steeg, 2005b).

Although past research supports the relationship between self-efficacy and attitude, some studies have found that an individual with a low sense of self-efficacy will more likely give up in the face of difficulty or not adopt a behaviour even if it is perceived as highly beneficial. This suggests a strong direct association between self-efficacy and intention (Orji, Vassileva, & Mandryk, 2012; Pajares, 2002).

In OHIS studies, Yoo and Robbins (2008) found that the individuals who intended to use the online sources to seek information were those who had confidence regarding their abilities to use those online sources. In support of this finding was Lim et al.'s (2011) study, which concluded that individuals who intend to use mobile technology to search for health information must first perceive that they have the capability to do so. De Veer et al. (2015) study of OHIS in older individuals showed that the inclination towards health information system use was largely based on the individuals' perceptions of their own capabilities and how achievable the behaviour of using the systems were. Studies from the technology adoption and acceptance literature have also supported the relationship between self-efficacy and intention (Hsu & Chiu, 2004; Tan & Teo, 2000). These findings lead to the following hypothesis:

H7b: Self-efficacy is positively related to intentions to use online systems to seek health-related information.

3.2.8. Attitude

An individual's attitude refers to the favourable or unfavourable evaluation of a psychological object. In relation to behaviour, it is conceivable for an individual to have greater intentions to perform a behaviour they view as beneficial (Fishbein & Ajzen, 2011b). As such, the relationship between attitude and intention in this research refers to the degree to which an individual's favourable assessment influences their intentions to seek health information online.

Prior studies show attitude to be a central construct and key predictor of intention across many behaviours including IS-related behaviours, such as in technology acceptance and use (Fishbein & Ajzen, 2011b; Taylor & Todd, 1995; Wixom & Todd, 2005). Empirical research on the adoption of online technology has endorsed the positive relationship between attitude and intention. For example, in studies concerning the acceptance of electronic banking services conducted by Hsu and Chiu (2004), Lee (2009) and Tan and Teo (2000), support was provided for a relationship between attitude towards the system and intention to use the system. Similarly, OHIS studies by Kim and Park (2012), Yoo and Robbins (2008), Yun and Park (2010) and Wong et al. (2014) suggest that the significant relationship between attitude and intention holds true across age, gender and geographic differences.

Studies also show that individuals are more motivated to seek health information online when there are perceived advantages of doing so (Berger, Wagner, & Baker, 2005; Dubowicz & Schulz, 2015; Morahan-Martin, 2004; Nettleton et al., 2005; Sillence et al., 2007; Walther, Pingree, Hawkins, & Buller, 2005b). One of the key benefits of online health information systems is that they cater to different demographics and information needs. For example, Berger et al. (2005) found that adolescents preferred to seek health-related information online because it allows them anonymity, especially for stigmatised illnesses. This anonymity is not as easily obtained through any other medium, therefore, they were in favour of OHIS. Conversely, De Veer et al. (2015) note that individuals who do not view online health behaviours as advantageous would be less likely to engage further in online health behaviours such as OHIS. Therefore, it is expected that if an individual views OHIS as favourable, it is more likely for them to intend to seek health information using an online system. The following hypothesis is proposed:

H8: Attitude is positively related to intentions to use online systems to seek health-related information.

3.2.9. Past Use

Prior research suggests that past behaviour is a strong predictor of intentions and future behaviour (Ajzen, 2002; Ajzen, 2011). In this study, the relationship between past use and intention refers to the degree to which an individual's past health information seeking behaviour influences the individual's future intentions to seek health information using an online system. Studies across disciplines have supported this relationship; these range from studies investigating smoking cessation to that examining mobile application acceptance (Hew, Lee, Ooi, & Wei, 2015; Van Der Rijt & Westerik, 2004; de Vries, Backbier, Kok, & Dijkstra, 1995).

Past use is a concept that many OHIS researchers have incorporated into their studies to better understand OHIS behaviour and intentions. Yoo and Robbins (2008) regarded past use as a highly

important influencer of intention. Not only did past use significantly contribute to explaining variance in intentions, it also rendered perceived behaviour control insignificant. This finding suggests that if an individual has had prior experience with a behaviour, these occurrences may be more fitting indicators of future intentions rather than factors such as perceptions of capabilities or control over executing a behaviour.

Experiences of past use establishes an impression in individuals such that some individuals have even been observed to directly refer to these past OHIS occurrences when making decisions regarding future use (Chang & Im, 2014; Lim et al., 2011). Therefore, it appears that individuals are influenced by their past use experiences, and these inform future intentions (Taylor & Todd, 1995). The following hypothesis is proposed:

H9: Past use is positively related to intentions to use online health information systems to seek health-related information.

3.2.10. Summary

Table 1: Research Hypotheses

Hypotheses	
H1a	Source credibility is positively related to satisfaction with online health information.
H1b	Source credibility is positively related to satisfaction with online systems.
H2a	Information quality is positively related to satisfaction with online health information.
H2b	Information satisfaction is positively related to the perceived usefulness of using online systems to seek health-related information.
H3a	System quality is positively related to satisfaction with online systems.
H3b	System satisfaction is positively related to satisfaction with the online health information.
H3c	System satisfaction is positively related to the perceived ease of use of using online systems to seek health-related information.
H4a	Perceived ease of use is positively related to the perceived usefulness of using online systems to seek health-related information.
H4b	Perceived ease of use is positively related to attitude towards using online systems to seek health-related information.
H4c	Perceived ease of use is positively related to self-efficacy regarding use of online systems to seek health-related information.
H5a	Perceived usefulness is positively related to attitude towards using online systems to seek health-related information.
H5b	Perceived usefulness is positively related to intention to use online systems to seek health-related information.
H6	Social influence is positively related to intentions to use online systems to seek health-related information.

H7a	Self-efficacy is positively related to attitude towards using online systems to seek health-related information.
H7b	Self-efficacy is positively related to intentions to use online systems to seek health-related information.
H8	Attitude is positively related to intentions to use online systems to seek health-related information.
H9	Past use is positively related to intentions to use online health information systems to seek health-related information.

Methodology

This chapter describes the methodology used in this research. The research paradigm outlines epistemological and ontological assumptions, including the approach to research. The data collection procedure is then described, followed by the design and development of the research instrument, and the data analysis techniques.

4.1. Research Paradigm

A research paradigm defines the basic beliefs or worldview that a researcher holds about knowledge and their approach towards knowledge (Guba & Lincoln, 1994). A research paradigm shapes ontological and epistemological assumptions, and also the methodological approaches of the researcher (Bryman & Bell, 2011; Guba & Lincoln, 1994; McKerchar, 2012).

This research adopts a positivistic epistemology, using a quantitative research method. Positivists believe in the existence of an independent reality which can be observed with scientific and mathematical methods (Bryman & Bell, 2011; Guba & Lincoln, 1994). Aiming to explain and predict phenomena, theory is tested and verified before it is regarded as knowledge and truth (Guba & Lincoln, 1994).

Positivist research generally employs quantitative research methods to explore phenomena and collect data. Techniques such as surveys and controlled experiments are primary quantitative data collection methods, which is followed by statistical analyses of the data (Orlikowski & Baroudi, 1991). Using quantitative research strategies for observation and measurement, the researcher is able to assume an objective position to the research object, without influencing or being influenced by the research object to yield unbiased and 'value-free' observations (Guba & Lincoln, 1994). These observations can be used to verify or contradict theories (Chua, 1986).

The validation of findings is crucial in positivist research, with the process of verification of theory and knowledge being conducted through the testing of hypotheses using empirical data (Bryman & Bell, 2011; Guba & Lincoln, 1994). Using deductive theory, hypotheses are formed based on what is already known in the research domain to identify relationships and form principles about behaviour, which are subsequently tested through the application of statistical methods. These principles of behaviour are intended to generalise and predict human action beyond the span of the research respondents (Bryman & Bell, 2011; Tashakkori & Teddlie, 1998).

Integrating existing theory to form the research model, this study investigates the factors influencing an individual's intentions to seek health information online. Confirmatory in nature,

theorised relationships in the research model are presented in the form of hypotheses, deduced from prior research and theory. Partial Least Squares (PLS) path modelling, a form of structural equation modelling is the statistical method used to test and validate the relationships hypothesised by the research model.

4.2. Research Design

4.2.1. Data Collection Procedure

The target audience for this study is persons over the age of 18-years who use online health information systems (e.g. websites, such as healthinfo.org.nz, mayoclinic.org, and webmd.com) to seek health-related information. An online survey was developed for the purpose of this research, with instruments derived from prior research to measure the different constructs corresponding to the research model. These measures were adapted to fit the research context of health information seeking using an online system, and carefully revised to ensure they appropriately assessed each construct in the research context.

The participants responded through an online survey created in Qualtrics, and made available between February and April 2016. The primary sampling method used in the research collection process was a variation of snowball sampling. This involved an initial distribution to a contact group, through which further relevant contacts can be identified (Bryman & Bell, 2011). However, a limitation of this sampling method is that it is unlikely that the sample is representative of the population (Bryman & Bell, 2011). This sampling method was implemented by sharing the survey link through personal social networks, and inviting participation from interested individuals who had previously sought out health information online. Participants were also invited to share the survey link with others among their social networks.

The second sampling method employed was convenience sampling. This involved the distribution of the research instrument to groups which are accessible to the researcher (Bryman & Bell, 2011). This included the use of posters containing a QR code and a shortened URL placed around the university campus, along with the distribution of small (business-styled) cards containing the QR code and URL to students, co-workers, and staff in local work areas. Similar to snowball sampling, a limitation of convenience sampling is that the responses may not be representative of a population (Bryman & Bell, 2011). However, efforts were made to diversify the sample by distributing the survey link to more than one ‘convenience’ group (i.e. students, work groups).

As a result of using these data collection techniques, it was not possible to accurately assess non-response as one cannot tell who may have viewed the survey, but did not proceed. This includes

the individuals from the original distribution who had forwarded the link to contacts, as well as further distributions via poster advertising. As the survey is both voluntary and anonymous, it was also not possible to tell who from the 'known' contact groups may have completed the survey.

4.2.2. Instrument Design & Development

1.1.1.4. Design

Twelve constructs were measured in this research: information quality, system quality, information satisfaction, system satisfaction, source credibility, perceived ease of use, perceived usefulness, attitude, social influence, self-efficacy, past use and intention to seek health information online.

The survey was divided into three main sections (See Appendix A). The first section informed individuals of the purpose of the survey, their assured anonymity in data collection, and their right to discontinue participation at any point. This section also re-emphasised the target demographic of the survey, and introduced the study, requesting the individual to specify the online channel and online sources that they used for health-related information seeking. This ensured that the collected data was relevant to the study of individuals who seek health information online and screened out individuals who did not use online systems to seek health information. Consequently, many of the incomplete surveys stopped at this point.

In the second section, individuals were asked about their current use of online systems to seek health information. This was followed by questions targeting the constructs in the research model (e.g. Information Quality, Information Satisfaction, Perceived Usefulness, etc.). In the final section four demographic questions were asked regarding age, gender, education, and ethnicity. The ordering of the sections were carefully considered in the study design, with questions that may evoke an emotional response placed near the end of the survey so as not to cause distress to the individual early on in the process.

Most constructs (e.g. Information Quality, Information Satisfaction, etc.) were assessed using seven-point Likert-type scales, which ranged from -3 (strongly disagree) to +3 (strongly agree), with 0 (neither agree nor disagree) as the neutral point. A few constructs were also measured using seven-point semantic differential scales. For example, the construct 'Attitude' used seven-point semantic differential scales anchored by paired adjectives such as 'unpleasant' (-3) vs. 'pleasant' (+3) and 'unenjoyable' (-3) vs. enjoyable (+3)'. Details of these scales are given in Appendix A.

1.1.1.5. Scale Development

For this study most of the measures were adapted from prior research (See Appendix A for item details). Information quality and system quality were measured using a set of three items adapted from Wixom and Todd's (2005) instruments for assessing information and system quality and reworded for the research context. A four-item semantic differential scale adapted from Bhattacherjee's (2001) study on system usage continuance intentions, Chin and Lee's (2000) research on end-user satisfaction, and Spreng, MacKenzie and Olshavsky's (1996) study focusing on consumer satisfaction were used to assess information satisfaction and system satisfaction.

Source credibility was measured using a four-item semantic differential scale with paired adjectives that were developed based on prior research by Bart, Shankar, Sultan and Urban (2005) and Grewal, Gotlieb and Marmorstein (1994) for use in consumer research; this focused on online information and message framing.

Perceived ease of use (four items) and perceived usefulness (five items) were both adapted from Davis's (1989) measurement scales for the TAM, which were further validated in Wixom and Todd's (2005) user satisfaction and technology acceptance research.

As with the satisfaction items, attitude was measured using a seven-item semantic differential scale, as the use of polarity scales are appropriate for measuring attitudinal dimensions (Ostrom, 1989).The items were adapted from Wixom and Todd (2005) and Ajzen's (2002) scales for constructing a Theory of Planned Behaviour (TPB) questionnaire. The three items assessing social influence were also adapted from Ajzen's (2002) TPB measurement scales. Self-efficacy consisted of four items adapted from Ajzen's (2002) TPB measurement scales, items used by Compeau & Higgins' (1995) in computer self-efficacy research, and Bandura's (2006) self efficacy scales.

Past use measures were generated to assess the individual's past use of online health information sources. Four items were used to assess the individual's past use. These focused on length of time the individual has used the system to seek health-related information, frequency of seeking health-related information provided by the system, frequency of using the system to seek information, and time spent for each information seeking session.

Finally, three items were used to measure intention to use the online system to seek health information. These were adapted from the scales used by Wixom and Todd (2005).

Altogether, there were a total of 48 items across 12 constructs, besides demographic and preliminary questions. In a pre-test evaluation, these instruments were reviewed and validated by three academics, with two from the College of Business and Law and one from the School of Health Sciences.

1.1.1.6. Ethical Considerations

The final survey was reviewed and approved by the University of Canterbury Human Ethics Committee. The survey assured participants that their responses would be anonymous and of the confidentiality and security of the information collected. Participants were also assured of their right to discontinue the survey. The approval letter confirming the ethical standards applied to this project is attached in Appendix B.

4.2.3. Data Analysis Technique

The Partial Least Squares (PLS) Path Modelling approach is used in this study to assess the measures and evaluate the paths in the research model. It focuses on analysing variance in the dependent variables (Hair Jr, Hult, Ringle & Sarstedt, 2016; Wong, 2013). PLS is a component-based structural equation modelling approach that is widely accepted and used for testing theoretical models, and has been used in prior research to evaluate technology adoption and use, including the use of the internet for disseminating and accessing health-related information (Mou & Cohen, 2016; Mun, Yoon, Davis & Lee, 2013).

Assessing both reflective and formative measures, PLS allows the measurement model (paths between the indicators and the construct) and structural model (i.e. paths between the constructs) to be assessed simultaneously (Götz, Liehr-Gobbers & Krafft, 2010; Hair et al., 2013). Using the nonparametric resampling method of bootstrapping, subsamples are drawn with replacement from the original sample, placing minimal demands on sample size and distributional assumptions (Hair Jr et al., 2016; Vinzi, Trinchera & Amato, 2010; Wong, 2013). Therefore, it is also useful when the sample size is relatively small compared to the complexity of the research model (Chin, 2010; Hair et al., 2013).

Using the SmartPLS (version 3.2.3) software developed by Ringle, Wende & Becker (2015), the measurement model was assessed for internal consistency, reliability, and convergent and discriminant validity (Chin, 2010). The tests of the paths in the structural model include examining the path coefficients (similar to standardised beta weights in a regression analysis) and their significance levels. To analyse demographic and usage characteristics, SPSS Statistics (version 24) was used.

Data Analysis and Findings

This chapter presents the results of the data analysis. The first section focuses on the demographic and usage information describing the survey sample. The second section provides results of the PLS path modelling analysis, and an initial examination of the results of the tests of the research model; this is followed by a summary of the hypothesis findings.

5.1. Data Analysis Results

5.1.1. Demographics

Table 2 presents demographic information provided by the participants. There were a total of 116 usable surveys from the total of 177 survey responses received; 61 were discarded as they were incomplete. The survey had a usable completion rate of 66%.

The participants consisted of 58% females and 42% males. A large portion of the sample were aged 29 years or under (78%), followed by 16% who were aged between 30-49 years, and 6% who were aged 50 years or over. Of the participants, 20% had a postgraduate degree, 38% had an undergraduate degree, 13% had a tertiary diploma or certificate, 16% had undertaken some undergraduate degree study, and 13% held other qualifications. The categories used in this study for ethnicity were based on Statistics New Zealand's 2015 profile booklet (http://www.stats.govt.nz/browse_for_stats/snapshots-of-nz/nz-in-profile-2015.aspx). On ethnicity, the data showed approximately 54% of participants identifying with being European or Other, 32% identifying as Asian, 3.8% identified with being a Pacific person, 3.1% identified with being Māori, 2.3% identified with being Middle Eastern, Latin American, African; 4.6% preferred not to say.

Table 2: Participant Demographics

	No.	%		No.	%
Gender			**Education**		
Female	67	57.8%	Undergraduate Degree Study	43	37.1%
Male	49	42.2%	Postgraduate Degree Study	23	19.8%
			Some Undergraduate Degree Study	19	16.4%
Age			Secondary School Qualification	12	10.3%
Under 20 years	18	15.5%	Tertiary Diploma	9	7.8%
20-24 years	50	43.1%	Tertiary Certificate	7	6.0%
25-29 years	23	19.8%	Other	3	2.6%

30-34 years	5	4.3%			
35-39 years	4	3.4%	**Ethnicity**		
40-49 years	9	7.8%	European or Other	70	53.8%
50 and older	7	6.1%	Asian	42	32.3%
			Pacific Peoples	5	3.8%
			Māori	4	3.1%
			Middle Eastern, Latin American, African	3	2.3%

5.1.2. Usage

In this study participants were asked to identify the online health information system (e.g. webmd.com; mayoclinic.org, etc.) that they use the most. Table 3 presents usage information for the online health information systems used most by the participants. Results show that 30% of participants have used their specified system to seek health information for approximately one year to less than three years, 29% have used their system for three years to less than five years, 16% for five years to less than ten years, while 11% had used it for six months to less than one year, and 12% for less than six months; only one participant (0.9%) had used it for more than ten years.

The participants were also asked about the frequency with which they search for online health information using their preferred system. Most of the participants (42%) indicated that they to seek health information using their preferred online system a few times a year, 19% about once a year or less, 18% about once a month, 10% a few times a month, 5% about once a week, and 6% a few times a week.

The general reason for the participant's information seeking was also examined. The participants were able to select as many options as were relevant. 44% used their preferred online health information system to search for information on specific health topics, 29% used the system to search for general health information, 14% used the system to help monitor their health, 5% to assist with health goals, and 3% for health-related peer support groups. The remainder 5% cited other reasons such as classifying symptoms or seeking information on behalf of friends. See Table 3 for further detail.

Table 3: Participant System Usage Statistics

	n	%
Experience (Using the online health information system)		
< 1 month	5	4.3%
1 month < 6 months	9	7.8%

6 months < 1 year	13	11.2%
1 year < 3 years	35	30.2%
3 years < 5 years	34	29.3%
5 years < 10 years	19	16.4%
10 years >	1	0.9%
Time **(Amount of time spent each information seeking session)**		
Less than 10 minutes	35	30.2%
10 < 20 minutes	43	37.1%
20 < 30 minutes	26	22.4%
30 minutes < 1 hour	10	8.6%
1 < 3 hours	2	1.8%
Purpose **(Purpose of seeking health-related information)** *Note: multiple responses allowed*		
To search for information on specific health topics	88	44.0%
To search for general health information	57	28.5%
To monitor my health	28	14.0%
To assist with my health goals	11	5.5%
To search for information from health-related peer support groups	6	3.0%
Other*	10	5.0%

**Responses included: To classify symptoms; helping friends; Only when I think I might have a health issue; When someone mentions something i.e. friend had shingles, to clarify what it actually is, symptoms, how contagious etc, rather than ask the person direct; To assist in finding out what the cause of my symptoms may be when I feel unwell.*

5.2. Research Model Results

This section presents the results of the analyses of the measurement model and the structural model using SmartPLS 3.2.3 (Ringle et al. 2015). Firstly, the results of the evaluation of the relationships between indicators and constructs in the measurement model are presented. Secondly, the results of the tests of the hypotheses in the structural model are presented. The research model contains 12 constructs, 11 of which are reflective and 1 (Past Use) formative. Different evaluation criteria apply

to formative versus reflective constructs; these are presented below with the results of the reflective indicators presented first, followed by that for the formative construct.

For this study, the evaluation of reflective measurement models include the assessment of indicator reliability, internal consistency using composite reliability (CR), convergent reliability using average variance extracted (AVE), and discriminant validity (Hair, Ringle & Sarstedt, 2011). The reflective variables are: Information Quality, System Quality, Information Satisfaction, System Satisfaction, Source Credibility, Perceived Usefulness, Perceived Ease of Use, Perceived Risk, Attitude, Self-Efficacy, Social Influence, and Intention. The formative variable in this study is Past Use. For formative measurement models, the evaluation focuses on collinearity and indicator significance.

5.2.1. Common Method Bias

Common Method Bias refers to the variance that is attributable to the measurement method used rather than the represented constructs of the measures (Podsakoff, MacKenzie, Lee & Podsakoff, 2003). The assessment of common method bias was carried out using a Harman's single factor test to assess the total variance explained by the indicators on SPSS. This value should be less than 50%. The findings of the test concluded a variance value of approximately 44%. This suggests that any variance present is of an acceptable value, and not a concern for the current study.

5.2.2. Measurement (Outer) Model – Reflective Measures

1.1.1.7. Indicator Reliability

Indicator reliability refers to the extent to which each indicator reflects its own construct- an established principle is that the indicator should explain at least 50% (0.708^2) of the variance in the indicator (Hair et al., 2013). Therefore, the recommended value for an indicator's outer loading is above 0.70; Hair et al. (2013) further suggest that indicators with a loading between 0.40 and 0.70 should only be considered for removal if it leads to the composite reliability (CR) or average variance extracted (AVE) meeting their suggested thresholds. Indicators with outer loadings below 0.4 should be considered for elimination from the scale (Hair et al., 2011).

This study showed all indicators the exceeded the recommended outer loading value (or 0.708), with values ranging from 0.767 to 0.980 (See Table 4). This confirms that the overall reliability for the reflective indicators is acceptable.

1.1.1.8. Internal Consistency

Internal consistency is a judgement of whether the indicators are reliable measures of each construct (Hair et al., 2013). It is important to assess that the constructs and their indicators are strongly related. Moreover, that the indicators do not hold a stronger relationship with another construct than with their own construct (Chin, 2010). A CR measure can be used to assess this relationship. Varying between 0 and 1, the recommended threshold is a CR value that is approximately above 0.70 (Hair, Anderson, Tatham & William, 1998). In this study, the internal consistency is acceptable for all constructs, with CR values ranging from 0.879 to 0.980, and above the recommended threshold of 0.70 - See Table 4.

1.1.1.9. Convergent Validity

Convergent validity refers to the degree to which an indicator of a construct positively correlates with other indicators of the same construct (Hair et al., 2013). The convergent validity was assessed using the Average Variance Extracted (AVE). The recommended threshold is that the AVE value is at least 0.50, meaning that the construct should account for more than half of the variance of its indicators (Chin, 1998; Fornell & Larcker, 1981). The AVE of the indicators as shown in Table 4 ranges from 0.684 to 0.942, exceeding the recommended minimum of AVE value of 0.50. Therefore, the convergent validity is adequate for all constructs.

Table 4: Measurement (Outer) Model - Reflective Measures

Factor	Outer Loadings	CR	AVE	Factor	Outer Loadings	CR	AVE
Source Credibility		0.962	0.864	**Self-efficacy**		0.950	0.825
SC_1	0.89			SE_1	0.931		
SC_2	0.937			SE_2	0.87		
SC_3	0.96			SE_3	0.921		
SC_4	0.93			SE_4	0.91		
Information Quality		0.968	0.910	**Social Influence**		0.879	0.707
IQ_1	0.971			SI_1	0.867		
IQ_2	0.936			SI_2	0.849		
IQ_3	0.954			SI_3	0.806		
Information Satisfaction		0.952	0.831	**Perceived Usefulness**		0.957	0.816

ISAT_1	0.905			PUSE_1	0.896		
ISAT_2	0.936			PUSE_2	0.909		
ISAT_3	0.906			PUSE_3	0.923		
ISAT_4	0.899			PUSE_4	0.89		
System Quality		0.980	0.942	PUSE_5	0.897		
SQ_1	0.967			**Attitude**	0.95	0.950	0.731
SQ_2	0.98			ATT_1	0.828		
SQ_3	0.965			ATT_2	0.81		
System Satisfaction		0.963	0.867	ATT_3	0.813		
SSAT_1	0.945			ATT_4	0.907		
SSAT_2	0.934			ATT_5	0.877		
SSAT_3	0.921			ATT_6	0.853		
SSAT_4	0.923			ATT_7	0.893		
Perceived Ease of Use		0.957	0.848	**Intention**		0.896	0.684
PEOU_1	0.955			INT_1	0.878		
PEOU_2	0.898			INT_2	0.847		
PEOU_3	0.928			INT_3	0.812		
PEOU_4	0.901			INT_4	0.767		

1.1.1.10. Discriminant Validity

The measure of discriminant validity is the assessment of whether the indicators of a construct are unique to that construct when compared with other constructs in the model. There are two methods for assessing discriminant validity, examining the indicators' cross loadings and the Fornell-Larcker criterion (Hair et al., 2013).

The use of indicator cross loadings to confirm discriminant validity is achieved by assessing whether the indicator's loading with its own construct is higher than its cross loading with any other construct (Hair et al., 2011). The reasoning is that if an indicator of a construct is correlated with another construct more than it is with its own indicators, it is possible the indicators are not distinct and are measuring the same concepts (Chin, 2010). The use of cross loadings to test discriminant validity is found to produce results which are more liberal, therefore the Fornell-Larcker criterion is another method to confirm discriminant validity. The Fornell-Larcker criterion compares the square root of the AVE values with the construct correlation. The square root AVE value should be higher than

correlations with other constructs, as this suggests that the construct shares more variance with its own indicators than with other constructs (Hair et al., 2013).

Table 5: Indicator Loadings and Cross Loadings - Reflective Variables*

	ATT	PEOU	IQ	ISAT	INT	SE	SI	SC	SQ	SSAT	PUSE
ATT_1	**0.828**	0.300	0.426	0.603	0.411	0.432	0.352	0.542	0.553	0.621	0.469
ATT_2	**0.810**	0.265	0.394	0.657	0.483	0.357	0.374	0.508	0.511	0.660	0.405
ATT_3	**0.812**	0.231	0.350	0.657	0.409	0.314	0.330	0.492	0.454	0.677	0.379
ATT_4	**0.907**	0.395	0.497	0.631	0.426	0.548	0.342	0.625	0.519	0.550	0.543
ATT_5	**0.878**	0.424	0.508	0.654	0.410	0.498	0.320	0.629	0.491	0.548	0.532
ATT_6	**0.853**	0.457	0.500	0.660	0.397	0.525	0.328	0.646	0.476	0.612	0.565
ATT_7	**0.893**	0.383	0.477	0.666	0.372	0.447	0.313	0.598	0.454	0.600	0.500
PEOU_1	0.407	**0.955**	0.440	0.320	0.195	0.658	0.116	0.356	0.422	0.237	0.772
PEOU_2	0.418	**0.898**	0.458	0.367	0.180	0.648	0.174	0.404	0.460	0.276	0.694
PEOU_3	0.346	**0.928**	0.401	0.256	0.147	0.695	0.088	0.323	0.412	0.184	0.750
PEOU_4	0.356	**0.901**	0.323	0.204	0.143	0.612	0.121	0.303	0.362	0.184	0.670
IQ_1	0.519	0.423	**0.971**	0.657	0.395	0.578	0.402	0.612	0.684	0.477	0.612
IQ_2	0.480	0.416	**0.936**	0.657	0.408	0.569	0.377	0.584	0.657	0.467	0.580
IQ_3	0.518	0.428	**0.954**	0.681	0.442	0.565	0.420	0.663	0.690	0.495	0.605
ISAT_1	0.731	0.405	0.694	**0.905**	0.488	0.545	0.438	0.748	0.604	0.738	0.549
ISAT_2	0.705	0.316	0.658	**0.936**	0.558	0.437	0.470	0.703	0.563	0.765	0.527
ISAT_3	0.659	0.187	0.564	**0.906**	0.490	0.343	0.492	0.625	0.415	0.655	0.341
ISAT_4	0.647	0.204	0.609	**0.899**	0.447	0.389	0.377	0.648	0.422	0.667	0.391
INT_1	0.370	0.093	0.395	0.442	**0.878**	0.214	0.461	0.313	0.382	0.386	0.311
INT_2	0.446	0.089	0.376	0.533	**0.848**	0.228	0.402	0.347	0.308	0.447	0.307
INT_3	0.378	0.273	0.491	0.432	**0.816**	0.388	0.321	0.354	0.405	0.315	0.431
INT_4	0.410	0.152	0.191	0.400	**0.762**	0.116	0.387	0.258	0.336	0.398	0.215
SE_1	0.467	0.691	0.598	0.441	0.259	**0.931**	0.260	0.441	0.549	0.265	0.716
SE_2	0.464	0.576	0.483	0.435	0.264	**0.870**	0.157	0.459	0.432	0.289	0.593
SE_3	0.456	0.666	0.506	0.384	0.189	**0.921**	0.180	0.415	0.465	0.225	0.618
SE_4	0.521	0.647	0.578	0.464	0.299	**0.910**	0.319	0.468	0.549	0.349	0.665
SI_1	0.323	0.146	0.428	0.398	0.388	0.227	**0.868**	0.338	0.442	0.345	0.287

SI_2	0.285	-0.052	0.164	0.338	0.430	0.058	**0.848**	0.242	0.265	0.353	0.114
SI_3	0.390	0.266	0.488	0.501	0.385	0.380	**0.807**	0.524	0.382	0.366	0.407
SC_1	0.642	0.361	0.603	0.681	0.347	0.474	0.303	**0.890**	0.556	0.639	0.513
SC_2	0.600	0.316	0.623	0.700	0.373	0.431	0.430	**0.937**	0.546	0.615	0.500
SC_3	0.624	0.334	0.622	0.720	0.354	0.440	0.439	**0.960**	0.553	0.596	0.507
SC_4	0.656	0.392	0.569	0.692	0.349	0.485	0.433	**0.930**	0.534	0.652	0.581
SQ_1	0.579	0.425	0.707	0.573	0.421	0.564	0.448	0.639	**0.967**	0.636	0.608
SQ_2	0.548	0.444	0.692	0.528	0.408	0.536	0.407	0.546	**0.980**	0.626	0.594
SQ_3	0.556	0.443	0.667	0.522	0.432	0.505	0.389	0.526	**0.965**	0.578	0.556
SSAT_1	0.694	0.309	0.503	0.724	0.454	0.346	0.396	0.684	0.666	**0.945**	0.491
SSAT_2	0.660	0.229	0.486	0.738	0.492	0.313	0.391	0.641	0.616	**0.934**	0.416
SSAT_3	0.631	0.114	0.394	0.706	0.417	0.215	0.409	0.575	0.515	**0.921**	0.287
SSAT_4	0.651	0.229	0.483	0.733	0.379	0.286	0.376	0.599	0.548	**0.923**	0.398
PUSE_1	0.626	0.661	0.565	0.571	0.383	0.575	0.266	0.616	0.550	0.550	**0.896**
PUSE_2	0.521	0.766	0.576	0.442	0.314	0.662	0.243	0.457	0.546	0.369	**0.909**
PUSE_3	0.426	0.750	0.490	0.343	0.270	0.646	0.213	0.419	0.498	0.279	**0.923**
PUSE_4	0.493	0.686	0.556	0.425	0.388	0.628	0.282	0.514	0.538	0.372	**0.890**
PUSE_5	0.493	0.683	0.642	0.481	0.348	0.722	0.409	0.533	0.593	0.356	**0.897**

**Key: ATT= Attitude; PEOU= Perceived Ease of Use; IQ= Information Quality; ISAT= Information Satisfaction; INT= Intention; SE= Self-Efficacy; SI= Social Influences; SC= Source Credibility; SQ= System Quality; SSAT= System Satisfaction; PUSE= Perceived Usefulness.*

Table 6: Fornell-Larcker Criterion - Reflective Variables*

	ATT	PEOU	IQ	ISAT	INT	SE	SI	SC	SQ	SSAT	PUSE
Attitude	**0.855**										
Perceived Ease of Use	0.415	**0.921**									
Information Quality	0.530	0.443	**0.954**								
Information Satisfaction	0.755	0.314	0.697	**0.912**							
Intention	0.486	0.182	0.434	0.546	**0.827**						
Self-Efficacy	0.527	0.710	0.598	0.477	0.281	**0.908**					
Social Influences	0.393	0.135	0.419	0.487	0.478	0.256	**0.841**				
Source Credibility	0.678	0.378	0.650	0.751	0.383	0.493	0.432	**0.930**			

System Quality	0.578	0.450	0.710	0.558	0.433	0.552	0.428	0.589	**0.971**		
System Satisfaction	0.709	0.240	0.503	0.779	0.469	0.314	0.422	0.673	0.633	**0.931**	
Perceived Usefulness	0.571	0.785	0.628	0.505	0.378	0.715	0.313	0.565	0.605	0.432	**0.903**

Note: Square root of the AVE values shown bolded along the diagonal.

**Key: ATT= Attitude; PEOU= Perceived Ease of Use; IQ= Information Quality; ISAT= Information Satisfaction; INT= Intention; SE= Self-Efficacy; SI= Social Influences; SC= Source Credibility; SQ= System Quality; SSAT= System Satisfaction; PUSE= Perceived Usefulness.*

Discriminant validity represents the extent to which a construct is distinct from other constructs, that is, its indicators are expected to load more highly on their own construct than on any other construct in the model (Hair et al., 2013). To assess discriminant validity we examine the cross loading values. The second approach uses the Fornell-Larcker criteria which compares the square root of the AVE with the correlations for all other constructs (Hair et al., 2013).

The cross loading values and results from the Fornell-Larcker test are presented in Table 5 and Table 6 respectively. For all constructs the correlation is largest with its own indicators than any other construct (Table 5). Additionally, the square root AVE value is larger than correlations with other constructs (Table 6). Together these results satisfy this test for discriminant validity.

5.2.3. Measurement (Outer) Model – Formative Measures

1.1.1.11. Significance and Relevance

In this study Past Use was modelled as a formative construct. The significance and relevance of formative indicators is assessed by examining the indicator's outer weight and loading values. The outer weight indicates the relative importance of an indicator in relation to other indicators for that construct, while the outer loadings indicates the absolute importance of the indicator the construct (Hair et al. 2013). Both are important when assessing formative constructs. In this study the nonparametric resampling technique bootstrapping using 5000 resamples is used to generate the confidence intervals and t-values (Hair et al., 2013).

Following the bootstrapping procedure, the outer weight of the indicator is assessed in terms of the significance level; this is followed by an assessment of the outer loading values (which should be above 0.50) and significance levels if the outer weight is not found to be significant (Hair et al., 2013). It can be seen in Table 7 that one of the three indicators of Past Use (PASTUSE_2) is significant (p-value= <0.10, t-value= >1.65). Of the two indicators that had an insignificant outer weight (PASTUSE_1 and PASTUSE_3), the results showed that PASTUSE_3 had a significant outer loading value higher than 0.50. It

is further recommended that indicators that have insignificant outer weights, outer loadings, and outer loading significance values are removed from the scale (Hair Jr et al., 2016). Therefore, PASTUSE_1 has been removed.

Table 7: Measurement (Outer) Model - Formative Measures

	Outer Weights			Outer Loadings		
	Original Sample	T Statistics	P Values	Original Sample	T Statistics	P Values
PASTUSE_1	-0.124	0.631	0.528	0.125	0.66	0.509
PASTUSE_2	0.924	6.474	0.00	0.969	12.939	0.000
PASTUSE_3	0.24	0.947	0.344	0.503	2.111	0.035

1.1.1.12. Collinearity

The second test of formative variables considers an evaluation of collinearity, which refers to the assessment of the correlation between two or more indicators (Hair et al., 2013). It is expected that each formative indicator should not be highly correlated with other indicators, as each indicator represents a different facet of the construct (Vinzi, Trinchera & Amato, 2010).

Collinearity can be assessed by examining the tolerance (TOL) value or variance inflation factor (VIF). These two measures are related. The tolerance represents the amount of variance of an indicator that is not explained by the other indicators for the construct (Hair et al. 2013). TOL is calculated as the result of one minus the indicator's variance ($TOL=1-R^2$), and the VIF is the reciprocal of the TOL ($VIF= 1/TOL$) (Hair et al., 2013). The recommended threshold for TOL is a value higher than 0.20, and for a VIF value lower than 5 (Hair et al., 2011; Hair et al., 2013). As displayed in Table 8 the VIF values for the past use indicators are below 5, which leads to a corresponding TOL values higher than 0.20. This shows that collinearity is not an issue as there is no evidence of a high correlation between the indicators.

5.2.4. Structural (Inner) Model

Assessment of the structural model evaluates the paths between the constructs in the research model. This evaluation determines how well the data empirically supports the model, and therefore, the proposed hypotheses. The evaluation criteria for the structural model includes assessments of the path significance, the coefficient of determination (R^2 values), and the inner Variance Inflation Factor (VIF) values (Hair et al., 2011; Hair et al., 2013). The PLS results for the research model are presented in Table 9. As PLS modelling does not assume the data is normally distributed, a nonparametric bootstrapping procedure is used to test significance (Hair Jr et al., 2016). Bootstrap resampling (using

5000 resamples) was used to assess path significance between constructs at a critical t-value of 1.65 ($p=< 0.10$).

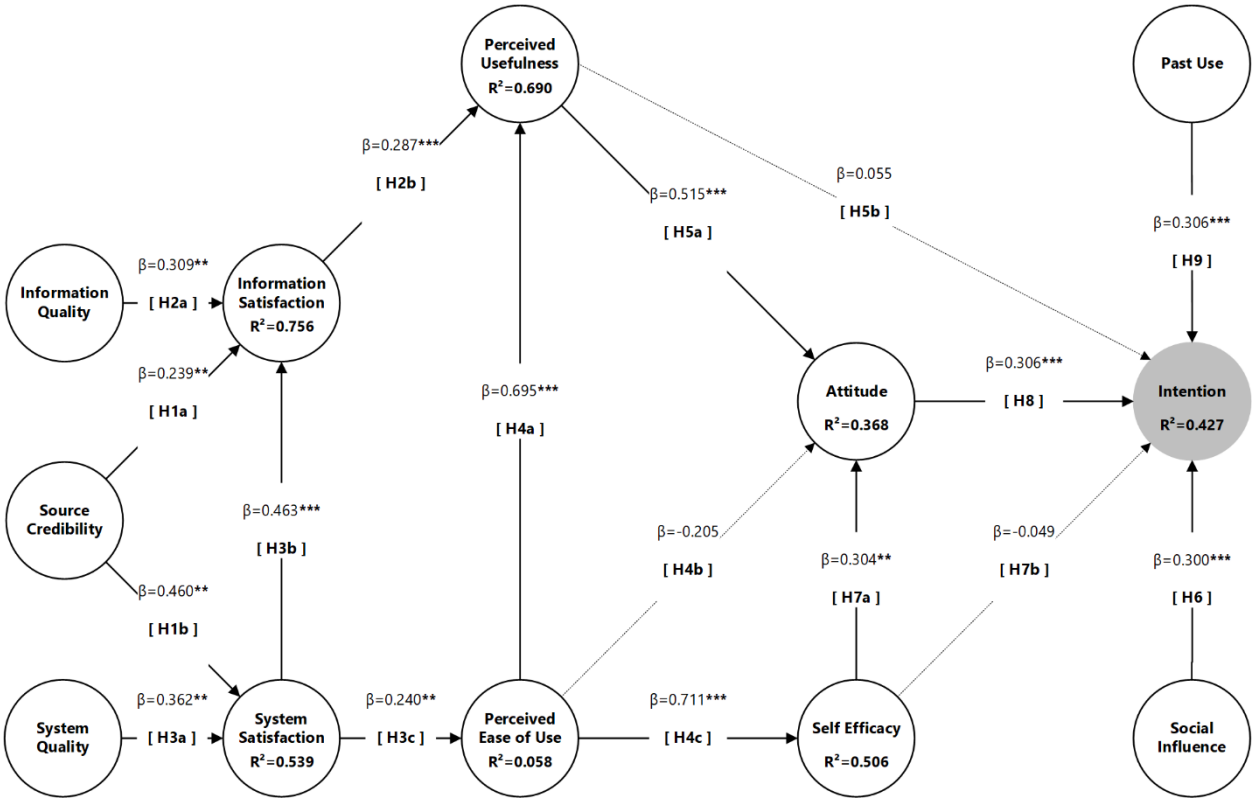
The coefficient of determination (R^2) is used to evaluate the degree to which an endogenous construct's variance reflects its independent variables. Consisting of exogenous and endogenous constructs, the exogenous constructs in the structural model are constructs which serve only as independent variables, whereas the endogenous constructs serve as dependent variables, or both independent and dependent variables (Hair et al., 2013). Ranging from 0 to 1, a higher R^2 value suggests a better predictive accuracy as this means that a higher amount of variance in a dependent construct can be predicted by the independent variables (Hair et al., 2013). The results of the structural model tests are presented in *Figure 5: Theoretical Model Results*.

The structural model should also be examined for collinearity issues to ensure that no constructs are highly correlated. This is assessed using the TOL value and inner VIF value. The acceptable values for the measures are TOL > 0.20 and VIF < 5 (Hair et al., 2013). As shown in Table 8, both the VIF and TOL values are at acceptable levels, hence there is not a significant level of collinearity between constructs.

Table 8: Inner VIF and TOL Values

Hypotheses		VIF	TOL
H1a	Source Credibility → Information Satisfaction	2.397	0.417
H1b	Source Credibility → System Satisfaction	1.531	0.653
H2a	Information Quality → Information Satisfaction	1.756	0.569
H2b	Information Satisfaction → Usefulness	1.109	0.902
H3a	System Quality → System Satisfaction	1.531	0.653
H3b	System Satisfaction → Information Satisfaction	1.854	0.539
H3c	System Satisfaction →Perceived Ease of Use	1.000	1.000
H4a	Perceived Ease of Use → Usefulness	1.109	0.902
H4b	Perceived Ease of Use → Attitude	2.960	0.338
H4c	Perceived Ease of Use → Self-efficacy	1.000	1.000
H5a	Perceived Usefulness → Attitude	2.990	0.334
H5b	Perceived Usefulness → Intention	2.439	0.410
H6	Social Influences → Intention	1.208	0.828
H7a	Self-Efficacy → Attitude	2.326	0.430
H7b	Self-Efficacy → Intention	2.144	0.466

H8	Attitude → Intention	1.672	0.598
H9	Past Use → Intention	1.11	0.901



*Significance level: * p=<0.10; ** p=<0.05; *** p=<0.001*

Figure 5: Theoretical Model Results

In Figure 5 the significant relationships between constructs are displayed as solid paths, whereas nonsignificant relationships have been represented as dotted paths. Although the thresholds for R^2 values can vary in different research contexts, Chin (1998) classified values of 0.67 as substantial, 0.33 as moderate, and 0.19 as weak (Henseler, Ringle & Sinkovics, 2009).

The results of the structural model in Figure 1 show that past use, social influence, attitude, perceived usefulness, and self-efficacy together explain a moderately strong variance of 0.427 in an individual's health information seeking intentions. However, only social influence (β=0.300; p=0.000), attitude (β=0.306; p=0.000) and past use (β=0.306; p=0.000) were significant, supporting hypotheses H6, H8, and H9. Neither perceived usefulness (β=0.055; p=0.629) nor self-efficacy (β=-0.049; p=0.661) were significantly related to intention to seek health-related information; as a result, hypotheses H5b and H7b are not supported.

Perceived usefulness, self-efficacy, and ease of use in combination explains moderate proportion of 0.368 of the variance in Attitude. Both perceived usefulness (β=0.515; p=0.000) and self-efficacy (β=0.304; p=0.014) were significantly related to attitude, supporting hypotheses H5a and H7a. Perceived ease of use (β=-0.205; p=0.207) was not found to be a significant predictor of attitude, thereby failing to support hypothesis H4b. Perceived ease of use explained 0.506 of the variance in self-efficacy (β=0.711; p=0.000)

Source credibility (β=0.239; p=0.035), Information quality (β=0.309; p=0.009), and system satisfaction (β=0.463; p=0.000) together explain 0.756 of the variance in information satisfaction. These findings support hypotheses H1a, H2a, and H3b respectively. Both source credibility (β=0.460; p=0.003) and system quality (β=0.362; p=0.026) had significant relationships to system satisfaction, explaining 0.539 of the variance. These support hypotheses H1b and H3a respectively.

Although a weak predictor of variance in perceived ease of use (0.058), system satisfaction (β=0.240; p=0.018) displayed a significant relationship with perceived ease of use, supporting hypothesis H3c. Hypothesis H2b and H4a were also supported, as information satisfaction (β=0.287; p=0.000) and perceived ease of use (β=0.695; p=0.000) were both significantly related to perceived usefulness, explaining 0.690 of its variance. These overall results of the hypothesis tests are summarised in Table 9.

Table 9: Hypotheses Results

Hypotheses		Path Coefficients	P Values	Results
H1a	Source credibility is positively related to satisfaction with online health information.	0.239	0.035**	Supported
H1b	Source credibility is positively related to satisfaction with online systems.	0.46	0.003**	Supported
H2a	Information quality is positively related to satisfaction with online health information.	0.309	0.009**	Supported
H2b	Information satisfaction is positively related to the perceived usefulness of using online systems to seek health-related information.	0.287	0.000***	Supported
H3a	System quality is positively related to satisfaction with online systems.	0.362	0.026**	Supported
H3b	System satisfaction is positively related to satisfaction with the online health information.	0.463	0.000***	Supported
H3c	System satisfaction is positively related to the perceived ease of use of using online systems to seek health-related information.	0.24	0.018**	Supported
H4a	Perceived ease of use is positively related to the perceived usefulness of using online systems to seek health-related information.	0.695	0.000***	Supported

H4b	Perceived ease of use is positively related to attitude towards using online systems to seek health-related information.	-0.205	0.207	Not Supported
H4c	Perceived ease of use is positively related to self-efficacy regarding use of online systems to seek health-related information.	0.711	0.000***	Supported
H5a	Perceived usefulness is positively related to attitude towards using online systems to seek health-related information.	0.515	0.000***	Supported
H5b	Perceived usefulness is positively related to intention to use online systems to seek health-related information.	0.055	0.629	Not Supported
H6	Social influence is positively related to intentions to use online systems to seek health-related information.	0.3	0.000***	Supported
H7a	Self-efficacy is positively related to attitude towards using online systems to seek health-related information.	0.304	0.014**	Supported
H7b	Self-efficacy is positively related to intentions to use online systems to seek health-related information.	-0.049	0.661	Not Supported
H8	Attitude is positively related to intentions to use online systems to seek health-related information.	0.306	0.000***	Supported
H9	Past use is positively related to intentions to use online health information systems to seek health-related information.	0.306	0.000***	Supported

5.3. Summary

The results of the data analysis and evaluation of the measurement model, and the structural model were outlined in this chapter. First, the demographic and usage statistics were described to gain a better understanding of the sample population. This was followed by the analysis of the measurement model; here relevant evaluation criteria are used to assess the reliability and validity of the indicators in respect of their associated constructs. Next, the structural model was analysed to determine whether the data supports the hypotheses, and the results reported. The next chapter will expand on the findings from this data analysis and discuss these in relation to the prior research, and implications for practice.

Discussion

The main objective of this research was to determine what factors influence an individual's intentions to seek health information online. To address this question, key factors were identified from existing literature to form a hybrid research model that integrates theory from IS (Wixom and Todd's (2005) Theoretical Integration of User Satisfaction and Technology Acceptance) and social psychology (Ajzen's (1991) TPB) in an online health information seeking context.

In this chapter, the relevance of each construct in the research model will be discussed under the heading of its dependent construct to expand on findings from the data analysis. The variance explained (R2) of dependent constructs by their respective independent constructs are discussed to evaluate the statistical significance of the relationships proposed in the hypotheses. The relationships between each relevant independent construct with the dependent construct of interest are examined at a 10% significance level.

6.1. Information Satisfaction

This study extends on the IS concepts used in health information seeking research to individually assess the information, system and the source components as distinct concepts. The findings from the data analysis show that information quality, source credibility, and system satisfaction are all positively significant influences of information satisfaction, collectively accounting for 0.756 of the variance in information satisfaction.

Source Credibility

The effect of source credibility on information satisfaction was found to be significant ($p=0.035$, $p < 0.10$), supporting hypothesis H1a. The significance of source credibility for information satisfaction in this study implies that an individual experiences more fulfilment with information provided by a source that displays expertise and is perceived as trustworthy and legitimate (Grewal et al., 1994). Prior literature has suggested the relevance of source credibility perceptions in the context of OHIS and as a contributing factor to information satisfaction (Eysenbach & Köhler, 2002; Sillence et al., 2007; Yan, 2010; Yun & Park, 2010). This is because individuals who seek health-related information online are purposeful in their seeking. If an individual has doubts about the credibility of an information source they will become apprehensive towards the health information, ultimately rendering the information unable to fully meet their needs (Sillence et al., 2007; Yun & Park, 2010). Thus, the significance of source credibility here further supports the notion that the perception held by individuals that they are seeking information from a trustworthy and competent provider plays a role in forming feelings of satisfaction towards the online health information.

Information Quality

It was hypothesised in this study that an individual's assessment of information as high quality would positively impact their sense of satisfaction towards the information, the results show that hypothesis H2a was supported ($p=0.009$, $p < 0.05$). This aligns with findings from prior research by Eysenbach and Köhler (2002), Fox and Duggan (2013), Morahan-Martin (2004) and Sillence et al. (2007a) who have observed that individuals accept or reject online health information based on quality assessments, and the notion that individuals react in a more content-oriented manner to information they perceive as high quality. Individuals that perceived the quality of online health information to be of a comparable quality to information from their health practitioner concluded their health information seeking activities online, not requiring further confirmation of their findings from a health professional (Fox & Duggan, 2013; Morahan-Martin, 2004). This showed that individuals were able to find health information online that met their quality standards, and were content with the information found using an online health information system, thus, further supporting the finding that information quality perceptions have an effect on an individual's sense of satisfaction towards online health information.

System Satisfaction

'Information' and 'system' cannot exist independently of each other in an online context. The p-value of 0.000 ($p < 0.01$) reflects the close tie between the carrier of information and the information itself. This positive and significant relationship between system and information satisfaction was anticipated (H3b). This relationship between system satisfaction and information satisfaction is supported by prior research that has found an individual's satisfaction with online health information to be strongly related to satisfaction with the system delivering the information, as the information itself is seen as an extension of the system (Kang & Lee, 2010; Lee, Choi, & Kang, 2009; Wixom & Todd, 2005).

6.2. System Satisfaction

Together source credibility and system quality explained 0.539 of the variance in system satisfaction. This further supports the inclusion of source credibility as an important concept in OHIS and validates the relationship between system quality and system satisfaction.

Source Credibility

The positive relationship between source credibility and system satisfaction supported hypothesis H1b ($p=0.003$, $p < 0.05$). Existing literature has alluded to the importance of source credibility perceptions (e.g. trustworthiness, expertise, lack of bias, etc.) in information seeking, and

demonstrated the relevance of the association between source credibility and system satisfaction in an OHIS context (Bliemel & Hassanein, 2007; Leckie et al., 1996; Robson & Robinson, 2013; Sillence et al., 2007). An individual's feelings of source-related trust, such as ownership trust of the health information website or authorship trust of the information author, are significant and positively impacts the sense of system satisfaction because the information source is tightly coupled with online health information system itself (Eysenbach & Köhler, 2002; Huntington et al., 2004). This is because an individual may think of the online health information system as the information author at times, such as information from a scientific institution's website being perceived as provided by the scientific institution as a whole. Source credibility related concepts are not often incorporated in empirical studies of online health information seeking. As the results of this study demonstrate, an individual's perception of an information source as credible is an important influence on satisfaction towards the system delivering the health-related information, hence justifying it's inclusion in the research model.

System Quality

Another significant influence of system satisfaction was system quality, supporting hypothesis H3a ($p=0.026$, $p < 0.05$). Bliemel and Hassanein (2007) argue that in the online health information context, system quality-related perceptions determine satisfaction with the system whether consciously or subconsciously as both system quality and satisfaction assessments are feelings and beliefs towards the system as a whole (Kang & Lee, 2010; Wixom & Todd, 2005). This is also consistent with findings from previous research in the online service context that indicate that an individual would be more strongly satisfied with an online health information system they perceive as high quality (Kang & Lee, 2010; Roca et al., 2006; Rodgers et al., 2005). These results support past research showing that an individual's sense of satisfaction with an online health information system is influenced by their assessment of the system's quality.

6.3. Perceived Usefulness

The impact of information satisfaction and perceived ease of use on perceived usefulness were proposed and supported by Wixom and Todd's (2005) research. The findings from this study empirically support both relationships by accounting for 0.690 of the variance in perceived usefulness.

Information Satisfaction

Holding a p-value of 0.000 ($p < 0.01$), the results supported hypothesis H2b by showing the significance of the relationship between information satisfaction and perceived usefulness. Although the link between information satisfaction and perceived usefulness has rarely been explored in online health information contexts, the results from this study further support the notion that an individual who

is satisfied with the online health information sought would also perceive OHIS using the online system as useful. This is consistent with studies across administration and online services, which has indicated a notable connection between the two constructs (Alharbi & Drew, 2014; Forsgren et al., 2016; Kang & Lee, 2010). Satisfaction with information indicates fulfilment of an information need such that if the information sought by the individual relevantly satisfies their information needs then they would perceive the online health information system to be useful in their OHIS process (Robson & Robinson, 2013).

Perceived Ease of Use

In support of hypothesis H4a, and in agreement with an established technology acceptance relationship, ease of use perceptions are highly correlated to perceptions of usefulness with a p-value of 0.000 ($p < 0.01$). Davis (1989) has described the close relationship between the constructs; a system that is easy to use cannot substitute the fact that the system does not perform a useful service, and likewise, a system which might be highly useful may not have its potential realised if the user finds the system difficult to use. Consistent with prior online health information seeking and online service literature, the results show that an individual's perceptions of an online system as easy to use for health information seeking purposes have a significant influence on the perceptions that the system is useful (Crespo et al., 2009; Kim & Park, 2012; Lee, 2009).

6.4. Perceived Ease of Use

System Satisfaction

The results show that system satisfaction is positively related to perceived ease of use ($p= 0.018$, $p < 0.05$), supporting hypothesis H3c. In line with research in online services contexts, the findings from this study supports the relationship between system satisfaction and perceived ease of use, here an individual's sense of fulfilment by the online health information seeking system is related to how easy or difficult they found the system to use (Alharbi & Drew, 2014; H. Lee et al., 2009). Although positively related and significant, the R^2 value of 0.058 shows that system satisfaction itself explains a small amount of variance in ease of use perceptions, which suggests that there are other factors which contribute to ease of use perceptions. Depending on the individual and their OHIS circumstances, potential factors influencing ease of use perceptions could range from design elements (e.g. layout or navigation) to search query and keyword refinements (Pang, Verspoor, Chang, & Pearce, 2015; Sillence et al., 2007).

6.5. Self-efficacy

Perceived Ease of Use

The relationship between perceived ease of use and self-efficacy showed strong support for hypothesis H4c ($p=0.000$, $p < 0.01$). This is consistent with OHIS studies which have associated the perceptions of ease or difficulty to learn to use a system (i.e. website, mobile, internet etc.) with self-efficacy, finding a connection between the amount of effort a system required and how achievable it would be for the individual to use the system to seek health information (de Veer et al., 2015; Lim et al., 2011). An easy to use system perceived to require low amounts of effort therefore encourage the sense of confidence in an individual's capabilities to use a system. Explaining 0.506 of the variance in self-efficacy, the findings from this study support prior research and indicate that the perception of a system as easy to use is a strong predictor of an individual's perception of their capability in using an online system to seek health information.

6.6. Attitude

The results from the findings show that self-efficacy, perceived usefulness and perceived ease of use explain 0.368 of the variance in attitude towards seeking health-related information online, although perceived ease of use was not found to be significant.

Self-efficacy

Self-efficacy was found to be significantly related to attitude ($p=0.014$, $p < 0.05$), supporting hypothesis H7a. Self-efficacy holds a crucial role in shaping individuals' feelings (Bandura, 1986; Compeau & Higgins, 1995; Hsu & Chiu, 2004). In fact, a low sense of self-efficacy means that an individual could develop negative feelings towards a behaviour, or perceive carrying out the behaviour to have a negative outcome (Bandura, 1986; Maddux & Rogers, 1983), whereas an individual's feelings of confidence in their ability to use the system can contribute to their ability to perceive benefits from seeking health information using an online system (Kim & Park, 2012). Consistent with prior research, this finding indicates that an individual's perception of their capabilities in using an online system to seek health information subsequently impacts their attitude towards online health information seeking.

Perceived Usefulness

As well as self-efficacy, perceived usefulness was also found to be positively related to attitude with a p-value of 0.000 ($p < 0.01$), supporting hypothesis H5a. This relationship is supported by prior research examining online service acceptance in contexts including online health information seeking (Chang & Im, 2014; Kim & Park, 2012; Yun & Park, 2010), online shopping (Crespo et al., 2009) and online banking (Lee, 2009). When individuals believe that the use of the online system improves their

ability to seek health information, they begin to view OHIS more positively. For example, Chang and Im's (2014) study showed that individuals perceived the online system as useful (through the proxy of convenience) because it allowed the individuals to seek health information online when they desired to, which led them to view health information seeking using an online system more favourably. The results of this study coupled with support from prior research indicate that the perception that an online system provides utility plays a significant and positive role in the formation of attitudes in health information seekers.

Perceived Ease of Use

Perceived ease of use was not found to be a significant predictor of attitude with a p-value 0.207, thereby failing to support H4b. This outcome is surprising as prior research and theory, such as Davis' (1989) TAM and OHIS studies (Kim & Park, 2012; Yun & Park, 2010), have demonstrated strong support between the assessment of effort required to use a system and its subsequent impact on attitude. Although this finding was not expected, there is research which may provide explanation on why ease of use perceptions did not have any effect on attitude. In a study assessing differing perceptions of experienced and inexperienced users of technology, Taylor and Todd (1995) found ease of use perceptions to only significantly influence attitude in inexperienced users. This finding is reflected in a study of pre- and post-adoption beliefs by Karahanna, Straub and Chervany (1999), which found ease of use perceptions only significant in the pre-adoption phase. These studies both suggest that perceived ease of use is only a salient factor for individuals that are inexperienced with technology. An explanation is that individuals who use a particular technology frequently may not be impacted by perceived ease of use because they have already overcome these ease/difficulty of use concerns, and therefore, attitude is more consistently influenced by other variables, such as perceived usefulness (Ajzen, 1991; Taylor & Todd, 1995). This notion is further supported by Wong et al.'s (2014) study of OHIS in older individuals, which found ease of use perceptions to be a highly significant concept due to the older sample demographics who were less educated and less experienced in internet use and OHIS. From this point of view, it is suggested that ease of use perceptions do not impact attitude towards OHIS for users that are more experienced with technology and OHIS. This matches the minimum expectations set for participants of this study - individuals who identify themselves as online health information seekers or having previously engaged in OHIS.

6.7. Intentions

Past use, attitude and social influences were found to be significant indicators of intentions. However, neither self-efficacy or perceived usefulness were found to influence intentions. All together the variables account for 0.427 of the variance in OHIS intentions.

Attitude

The positive relationship between attitude and intention supported hypothesis H8 ($p=0.000$, $p < 0.01$). This relationship has been strongly supported by theories such as the TPB and TRA (Ajzen, 1991; Fishbein & Ajzen, 1975b). The findings of this study are consistent with prior research in online health information seeking, which has empirically validated that an individual's intention to seek health information online is significantly affected by their attitude towards OHIS (Kim & Park, 2012; Yoo & Robbins, 2008; Yun & Park, 2010). This is because individuals who perceive advantages from seeking health information using an online system are more inclined to do so (Berger et al., 2005; Dubowicz & Schulz, 2015; Morahan-Martin, 2004; Nettleton et al., 2005; Sillence et al., 2007; Walther et al., 2005b). For example, some individuals seek health information online because it allows anonymity when seeking information related to sensitive or stigmatised health conditions (Berger et al., 2005).

Social Influence

Social influence was also found to positively relate to intention holding a p-value of 0.000 ($p < 0.01$) in support of hypothesis H6. This result of this study aligns with prior research on online system use, such as in banking and in health information seeking contexts (Ghalandari, 2012; Pan & Jordan-Marsh, 2010). These findings further support Neuhauser and Kreps (2003) who suggest that decision-making regarding health information seeking behaviour is highly related to social and life contexts, peers with mismatching health information seeking intentions can affect and limit another individual's decisions to engage in these health information seeking (Lambert & Loiselle, 2007). For example, an individual who desires to seek health information may be aided by a social network that shares this desire. The opposite can occur if their social networks do not share the individual's intentions, which leads individuals to refrain from health information seeking (Lambert & Loiselle, 2007). As a result, social influences play an important part in the formation of intentions to seek health information using a online system. After all, information behaviour does not occur in isolation of other individuals (Hargittai & Hinnant, 2006).

Past Use

Hypothesis H9 suggested that past use significantly impacts intention; this relationship was supported with a p-value of 0.000 ($p < 0.01$). While Ajzen (1991) argued for the indirect impact of past experience on intention through attitude, subjective norms, and perceived behavioural control, Yoo and Robbins (2008) found past experience to both directly and indirectly influence individual intentions to seek health-related information online. Bernhardt, McClain and Parrott (2004), Chang and Im (2014) and Lim et al. (2011) suggest that past use of online systems for seeking health information leads to

feelings of comfort and a sense of familiarity with the system, which influences future intentions to use the system (Leckie et al., 1996).

Self-efficacy

Self-efficacy perceptions did not significantly determine an individual's intentions in this study, failing to support hypotheses H7b with a p-value of 0.661. Prior research in the adoption and use of online services including health information seeking, banking, and learning, has produced stable results supporting the effect of self-efficacy on intention (Hsu & Chiu, 2004; Lim et al., 2011; Tan & Teo, 2000; Yoo & Robbins, 2008). In disagreement with prior research, the findings from this study suggests that an individual's perception that they are capable of OHIS is not a significant predictor of their desire to seek health information using an online system.

A possible explanation for this unexpected finding is that self-efficacy and intentions can sometimes exist as distinctly separate trains of thought (Eagly & Chaiken, 1993). For example, studies on motivation in self-regulated learning have described self-efficacy in terms of 'skill': "Am I able to?" while intention is described in terms of 'will': "Do I want to?". Noting that while an individual needs both the 'will' and the 'skill' for the performance of a behaviour to occur, an individual's ability to perform a behaviour is independent and not necessarily a precursor to their desire to perform said behaviour (Blumenfeld et al., 1982; Pintrich & De Groot, 1990). Extending on this explanation, Yoo and Robbins (2008) suggest that an individual's level of expertise or experience in online health information seeking may contribute to an insignificant relationship between self-efficacy and intention. They suggest that an individual who is already confident in their ability to seek health information using a online system may hold little regard towards their capabilities in their decision to seek or not seek information, further reinforcing the notion than the capability to perform a behaviour does not necessarily imply intent (Eagly & Chaiken, 1993).

Another plausible explanation for the insignificant outcome of this relationship may be that technology-based efficacy perceptions are not a primary concern of individuals when seeking health information online. This study measures perceptions of capabilities regarding ability to use a system to seek health information online. However, online health information seeking studies have commonly operationalised the concept of self-efficacy in more emotional terms relating to capability perceptions concerning their health (i.e. how capable does an individual feel they are in dealing with the health information) (Chen & Feeley, 2014; de Vries et al., 2005; Sillence et al., 2007). OHIS can be prompted by various factors, where some information seekers proactively seek health information while others may be reactively seeking information following a diagnosis. Past research has not indicated that there is a big difference between 'health' and 'illness' information seeking, but it has often related health information seeking to individuals with higher self-efficacy and information avoidance to low self-

efficacy (Chen & Feeley, 2014; de Vries et al., 2005; Lambert & Loiselle, 2007; Sillence et al., 2007). Low self-efficacy and feelings of powerlessness means that an individual may reject health information seeking if they do not perceive any 'purpose' in learning about matters they cannot control (Johnson, Andrews, & Allard, 2001). As a consequence, individuals who do not feel capable of dealing with the consequences of health information seeking will more likely avoid OHIS (de Vries et al., 2005; Lambert & Loiselle, 2007). Individuals who do not feel that they can deal with the online health information (i.e. that OHIS will generate feelings of fear or distress) will not intend to engage in OHIS, whereas individuals who felt capable of dealing with the information (i.e. OHIS will help me build confidence and minimise fear) have been observed to be more inclined to engage in OHIS (Chen & Feeley, 2014; de Vries et al., 2005; Sillence et al., 2007). Future research may benefit from exploring further, the impact of self-efficacy on OHIS intentions in emotional terms – that is, how capable does the individual feel they are in dealing with the online health information.

Perceived Usefulness

The results of this study did not find the effect of perceived usefulness to be significant for intention; hypothesis H5b was not supported with a p-value of 0.734. This was an unexpected finding as this is a key relationship proposed by the TAM (Davis, 1989) and also by Wixom and Todd's (2005) model, which was used as conceptual framework for the development of the research model. However, findings in past studies have provided mixed results – while Lim et al. (2011) and de Veer et al. (2015) found significant relationships between perceived usefulness and intentions to seek health information online, neither Wong et al. (2014) or Park (2009) found usefulness perceptions to affect intentions to seek health information online, or intentions to use an online learning service. Park's (2009) research on online learning did not find perceived usefulness or ease of use to be significant to intentions. In explaining this finding, Park (2009) suggested that their sample demographic (Korean university students) were already experienced with technology and aware of how easy it was to use and how much utility system use could bring. Therefore, these were no longer cognitive factors of intention and indirectly influenced intentions through attitude instead. This may also explain the results of this study as a strong relationship was found between perceived usefulness and attitude. Study participants were also limited to individuals who engaged in information seeking online, which suggests some level of technology adequacy. Moreover, over 75% of the study participants had been using their selected online systems to seek health information for more than one year, and over 45% for more than three years. As with Park's (2009) findings, the study participants' level of experience with OHIS may have resulted in perceived usefulness no longer being a significant predictor of intentions.

Another possible explanation is that an individual may engage in OHIS for ad hoc purposes as they occur, such as health-related decision making, researching a medical supplement, preparing for a

visit to a health practitioner (Morahan-Martin, 2004; Sillence et al., 2007). Therefore, an individual who has found an online health information system useful may not intend to use it in the future as they may not feel that they will require it.

Yet another potential explanation for the insignificant result may be due to the context of system use (i.e. mandatory vs. voluntary). Although perceived use has been found to predict intentions to use in voluntary contexts, as demonstrated by Agarwal and Karahanna (2000) and Tan and Teo (2000) who also found perceived usefulness to relate to intentions to use in the voluntary contexts of online learning and online banking, prior research has yielded more consistent results in mandatory contexts (such as with technology use in organisational settings) than in voluntary contexts. In settings of mandatory work technology use an individual's focus may heavily depend on their assessment of value from using the system and resultant job performance (Davis et al., 1989). The difference with voluntary system use contexts like OHIS is that individuals may begin to place a larger emphasis on other factors. Chen, Gillenson and Sherrell (2002) suggest that leisurely users of online systems may be influenced by other factors in their online experience beyond the functional perception of usefulness, such as interactivity and playfulness. This suggests that it is possible that individuals seeking health information online need to be incentivised by more than basic functional factors, such as finding a system useful.

6.8. Summary

This section discussed the relationships proposed in *Chapter 3: Research Model and Hypotheses Development by* expanding on the results of the data analysis *in Chapter 5: Data Analysis and Findings*. The results indicated support for most of the relationships proposed by the research model, but also returned some unexpected findings. Each hypothesised relationship was examined to better understand the significance of each result in the online health information seeking context

Conclusion

This thesis presents a comprehensive analysis on the influence of key social psychology, IS satisfaction and technology acceptance factors on OHIS intentions, with an emphasis on the role and importance of IS factors in OHIS. From this study, several theoretical and practical contributions are made to the field of OHIS. This research also had limitations and was not all-encompassing; therefore there is room for improvement and for future research to build on the findings of this study. These latter factors are presented in the limitations and suggestions for future research to help form a well-rounded view of OHIS.

7.1. Theoretical Contribution

This study further supported the applicability of established social psychology (Ajzen, 1991, TPB) and IS theory (Davis, 1989, TAM) in modelling behaviour from a wide range of contexts, and offers a theoretical model of online health information seeking. Using Wixom and Todd's (2005) model as a framework for integrating core theory and concepts, the formation of a theoretical model allowed the empirical testing of relationships between concepts proposed to influence OHIS intentions.

A large number of OHIS studies approach theory-based research with influence from the TPB and TAM, and in particular, IS theory influences were limited to the TAM. This study contributes to research by extending on the IS factors accounted for in the OHIS process. In particular, system factors have been given little attention in prior research in comparison to information-related factors. The theoretical model, based on the fundamental structure of Wixom and Todd's (2005) User Satisfaction and Technology Acceptance model, presents the information and system as closely-tied, but distinct constructs. The findings show that explicit perceptions about both the information and system (information quality, system quality, information satisfaction, system satisfaction) are important in the formation of OHIS intention, and therefore, both elements of an IS should be accounted for in OHIS research. Moreover, the theoretical model supports that the IS variables from user satisfaction can be complementary and integrated with the technology acceptance perspective to provide a more complete view of OHIS.

Furthermore, this research has made important contributions in providing a theoretical model to advance in theory around IS in health information seeking. Inconsistencies can often be observed in past research where researchers incorporate different sets of concepts, proposing different relationships and producing mixed results. To address this gap, the structure of this research model aimed to preserve existing theoretical relationships from the TPB and TAM, theories which had proven their explanatory power in OHIS, with Wixom and Todd's (2005) model to approach research in consideration with the principle of correspondence, the idea that beliefs and attitude towards an IS object align with use-related

beliefs and attitude towards using the IS object (Wixom and Todd 2005). The theoretical model produced in this study supports the notion of consistency by providing an IS theory based framework which allows further integrations with other salient concepts from OHIS.

In addition, the integration of salient concepts identified from qualitative and quantitative, theoretical and observational OHIS research (i.e. source credibility, past use, information quality, etc.) were examined together in a single model to provide a holistic view of OHIS intentions. This allowed the assessment of the various concepts and test the importance and relevance of each concept to OHIS, and also the research context.

7.2. Practical Contributions

Online health information seeking is unlikely to completely replace traditional information interactions from a health professional; it is however, a useful supplement that can assist health management efforts and encourage positive health outcomes for consumers (Lambert & Loiselle, 2007; Yan, 2010). Therefore, the findings from this study provides important practical contributions to the development of online health information initiatives.

The results of this study show support for previous studies that have stated the importance of source credibility perceptions for online health information seeking individuals. While a majority of users may not desperately pursue or investigate information sources in their everyday health information seeking instances where sources are not clearly stated, individuals have expressed that features encouraging source credibility perceptions are important, positive attributes of online health information (Eysenbach & Köhler, 2002; Sillence et al., 2007). This concern is pertinent as some individuals believe health practitioners should have a role in reviewing and recommending health information sites (Christian, Kieffer, & Leonard, 2001b). Moreover, this study shows that positive source credibility perceptions have an effect on subsequent satisfaction with a system and the health information provided by the system. Online health information providers should aim to communicate and present that the information is from a trustworthy and legitimate source. This could be in the form of displaying authorship or a verification symbol of the institution that provided the information (Eysenbach & Köhler, 2002). If it is not emphasised that the information is provided by a credible source, online health information providers may not be taking advantage of the value and impact that source credibility perceptions hold on individuals.

Information and system quality perceptions were found to be important in forming subsequent information and system satisfaction, respectively. Furthermore, system satisfaction also impacted information satisfaction. To ensure that users and providers are getting the most out of these online system investments, system providers should ensure that both information and systems components

receive equal attention and that quality assessments are targeted to the standards of the end user. As found in prior research, a layperson and a health professional tend to have vastly different opinions on the quality of online health information due to differences in their knowledge and expertise (Kim et al., 2011). Health professionals may assess information based on rigorous scientific criteria whereas a layperson may focus on how easy the information is to understand. System quality is also an important factor that may not get enough attention if a provider's main priority is to deliver high quality information and not a quality system experience. For example, past research has shown that individuals can disregard quality information due to dissatisfaction with the system, and not issues with the information itself (Sillence et al., 2007). The challenge for providers trying to supply individuals with quality health information is making sure that the aims of their initiatives, which dictate what is prioritised in system delivery, align with the priorities of an individual seeking online health information. Clearly information and system quality are important determinants of satisfaction with the information and system, and the overall intentions to seek health information using a particular system. Therefore, it is important in practice for online health providers to build upon the overall user experience that involves both the information and system components of an online system used for health information seeking.

Additionally, the finding that ease of use perceptions did not significantly determine attitude towards using an online system to seek health information as well as the finding that usefulness perceptions influences attitude, but not intention, further indicates that health information system providers should place importance on improving the overall user experience. The regular incorporation of technology into everyday lives changes the standard expectations individuals hold with technologies, especially for those that are more 'technology savvy'. The core technology acceptance factors, perceived usefulness and ease of use, become part of the expected high standard for systems and are more prominent or relevant to individuals when there are concerns. That is, ease of use is of low concern for the standard user in a technology assimilated culture and is not a high priority factor unless a system is difficult to use. There are many systems to choose from for online health information seeking. To remain competitive, a system needs to be more than just useful for an individual to intend to use it to seek health information because online health information seeking is a utility driven process. Individuals will seek health information online if there is value in doing so. Researchers should explore beyond the perceptions of usefulness and ease of use to examine factors of usage and adoption on a detailed, lower level, and system providers should aim to fulfil more than these fundamental elements of system use and introduce other "useful" functionalities that add value to system use.

7.3. Limitations

The first limitation of this study relates to the scope of the research. This study aimed to provide consideration for the aspects of the online environment that were not often accounted for in health information seeking research. However, this has led to the research to focus more on the factors of the information seeking context (technological environment) incorporated with social psychology concepts relevant to health, rather than specific elements of health (personal health beliefs) such as the individual's health status or health consciousness. The research model covered IS satisfaction, technology acceptance and key concepts from the social psychology literature, incorporating established theory with key OHIS concepts into the research model. Due to time constraints and to keep consistent with the research focus and aim, it was not feasible to include all the relevant factors to OHIS.

The next limitation is the small research sample size. The number of survey respondents were sufficient to test the 12 construct research model by (PLS) standards (Hair, Hult, Ringle, & Sarstedt, 2016). However, as sample size increases the 'likely precision' of the data collected also increases, improving generalisability by producing findings that are more representative of a population (Bryman & Bell, 2015).

Due to the data collection methods used and sample demographic of the study, another limitation relates to the generalisability of the research findings. The data was collected through a variation of snowball sampling (through distribution of a link on a social network) and convenience sampling (through posters at University and to work groups). This led to the primary respondents of the survey being Christchurch residents, mainly consisting of University students. The sampling methods employed in this study are unlikely to collect responses that are representative of the population (Bryman & Bell, 2015). Therefore, the findings of the study may not be very generalisable to the larger population.

Additionally, a limitation of the research measurements may have been the required designation of a specific online system at the beginning of the survey. Individuals were prompted to specify the online system they most frequently used to seek health information online. The online system field was used to dynamically change the wording of subsequent questions to refer to the specific system (e.g. How frequently do you look for health-related information provided by WebMD?). After the close of the survey a few individuals stated that they were unaware the survey would later be targeted towards the system that was named at the beginning. Specifying a system made completing the survey difficult for them, especially if they did not have any attachment to a specific system because they had to try and retrospectively recall their feelings and beliefs during the use of that specific system. This limitation may have also influenced the high proportion (33%) of incomplete surveys.

7.4. Future Research

As the focus of this study was to extend on the IS concepts currently accounted for in OHIS research, the breadth of concepts examined in the theoretical model was limited to IS factors. While this approach helped to elucidate the role of IS-related factors, it did not consider the role of health-related beliefs held by an individual which can also influence the formation of intentions to seek health information using an online system. The inclusion of theories and concepts from health literature, such as the Health Belief Model (HBM) (Hochbaum, Rosenstock, & Kegels, 1952) or the Integrated-Change (I-Change) Model (De Vries et al., 2005a), may help to contextualise the significance of different findings in relation to personal health beliefs. For example, in a study of online disease information seeking, perceived risk (conceptually found in the HBM and I-Change Model) was highly relevant to usefulness perceptions (Yun & Park, 2010). The majority of Yun and Park's (2010) study participants had personal (i.e. self or family member) experiences with a disease, which exemplifies how the inclusion of health-related variables can support the theme of the research and help to understand intentions under different circumstances.

In addition, health-related beliefs can help to set context around the research and give indicators around the demographic of the research participants (e.g. health status: how 'healthy' participants are according to study criteria (Ayers & Kronenfeld, 2007); health consciousness: how important, aware or concerned an individual is about health (Yun & Park, 2010)), which can increase the reproducibility of the research to help verify the research model and findings. Therefore, the inclusion of health-related variables may help to 'paint the full picture', contributing to a more robust theoretical model that ties an individual's personal health beliefs to factors of the technology environment, to better understand the factors which influence an individual's intentions to use an online system to seek health information.

With the inclusion of health-related theory and concepts in mind, health literacy in particular may be a significant concept to explore as an addition to the theoretical model. The health literacy of an individual is based on their ability to obtain, process, and understand information to make health decisions, this plays a role in influencing the motivation of health management behaviours (de Vries et al., 2005; Kōrero, 2010). The role of literacy is important, as an individual becomes more aware of their health situation and capable to perceive risks. The individual may not only take measures to lower risk, but also seek information to extend their knowledge (de Vries et al., 2005; Kōrero, 2010; Sillence et al., 2007). Therefore, it appears health literacy are significant in context of health management behaviours and could provide an indicator of an individual's positioning on health information seeking, to understand why they may or may not form intentions to seek health information using an online system. As a moderating variable to the theoretical model produced in this study, it could provide useful insights around the factors that are important to individuals of different literacy levels. This can help inform the

design and development of online systems to provide health information that is more accessible to its audience.

Another interesting path to explore is the different dimensions of quality and specific IS characteristics (e.g. accuracy, currency, etc.). Information quality and system quality variables are key aspects of the user satisfaction stream, as demonstrated by Wixom and Todd (2005a) and Forsgren et al. (2016), and specific beliefs about the IS object can extend on these user satisfaction variables and provide actionable assessments of an IS . This can add value by contributing to more detailed understandings of the specific IS factors that are important to individuals. Furthermore, results from the assessment of IS factors that are generally applicable to any system, such as reliability or flexibility, may give online system providers targeted feedback, which holds practical value in the development and improvement of their system.

Lastly, future research may extend on this study from a number of different approaches to further contribute to understandings of OHIS. For instance, longitudinal studies may explore the behavioural intentions of individuals pre- and post-adoption, this may shed light upon the non-significant impact of ease of use on attitude, and self-efficacy and perceived usefulness on intentions. Future research may also evaluate behaviour measures with longitudinal studies to examine how well the findings of this study and the concepts evaluated in the theoretical model reflect an individual's behaviour, as behavioural intentions were measured in this study and intentions are a key determinant of behaviour (Ajzen, 1991). Other opportunities may include a larger sample size, different demographic groups, users of a specific system, different types of health information (i.e. health wellness, disease, paediatric, etc.), and more. The use of the research model replicated in a wide variety of contexts may provide support for the findings of this study and verify the model's fit for explaining the factors that influence intentions to seek health information using an online system.

7.5. Concluding Remarks

This study has contributed to research through the examination of relevant theory and concepts extending key IS concepts into the OHIS context. The aim of this research was two-fold. Firstly, this study aims to address a gap in the current understanding of online health information seeking, by focusing on the technology and information aspects of online systems that impact influence online health information seeking. To address this aim, an examination of key theory use in OHIS literature provided a fundamental basis for understanding OHIS behaviour and intentions, helping position the research in IS terms. The exploration of themes and concepts revealed gaps in the favoured approaches past research has used to explain OHIS through the presentation of prominent factors and concerns of health information seekers. The second aim was to develop an integrated model that incorporates factors

influencing online health information seeking. To address this aim, this study drew on the theoretical frameworks of Wixom and Todd's (2005) User Satisfaction and Technology Acceptance Model, TPB and TAM, incorporated with key elements of OHIS as identified from literature to help understand the influence of these factors on intentions to seek health information using an online system. A majority of the relationships hypothesised in this relation were supported, and in particular, the IS concepts introduced from the user satisfaction research stream (information quality, system quality, information satisfaction and system satisfaction) and also source credibility were significant factors of the OHIS process. The incorporation of IS factors can help inform the design, development, and improvements of online health information systems by targeting the specific factors important to information seekers. Overall, the theoretical model provided a broad view of online health information seeking intentions from the social psychology, IS satisfaction and technology acceptance perspectives, with emphasis on the role of IS factors in the OHIS context.

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Appendix A: Survey Instrument

Invitation Page

You are invited to participate in a research project on the use of online sources to seek health-related information. The aim of this research is to develop a better understanding of the factors that impact an individual's intentions to search for health-related information online.

This project is being carried out as a requirement for a Masters of Commerce by Susan Zhu (susan.zhu@pg.canterbury.ac.nz) under the supervision of Associate Professor Annette Mills, who can be contacted at annette.mills@canterbury.ac.nz. She will be pleased to discuss any concerns you may have about participation in the project.

This survey is anonymous, and you will not be identified. Participation in this study is voluntary, and you may stop and withdraw any information you have provided, up until the survey has been submitted and added to the other data collected. As the survey is anonymous, your data cannot be withdrawn once it has been combined with the other data collected.

By completing this survey it will be understood that you have consented to participate in this project, and that you consent to publication of the results of the project with the understanding that your anonymity will be preserved.

A thesis is a public document and will be available through the UC Library. You may also request a copy of the results at the conclusion of this research. To receive a copy of the results, please email the researcher, Susan Zhu at susan.zhu@pg.canterbury.ac.nz.

This project has been reviewed and approved by the College of Business and Law and the University of Canterbury Human Ethics Committee, and participants should address any complaints to:

The Chair,
Human Ethics Committee,
University of Canterbury,
Private Bag 4800, Christchurch
email: human-ethics@canterbury.ac.nz

Thank you for your participation in this research project.

Introduction

This survey is aimed at individuals who use online channels (e.g. websites, apps) to look for or seek out health-related information. This survey should take approximately 20 minutes to complete.

Please answer all questions honestly. For each question, please select the response that you feel is appropriate and is to the best of your knowledge. If you find it difficult to determine your exact answer, please give your best estimate.

Some questions may appear very similar. This is intentional to ensure greater statistical reliability and accuracy. We would therefore greatly appreciate if you would answer all questions.

Key Terms

Health-Related Information: This refers to information on any topic that is related to and affects one's health or wellbeing.

Health Information Provider: This refers to the source(s) that you use to look for health information online.

e-Health System: This refers to the online health information system provided by your health information provider that enables you to find health-related information online.

Survey

Q1. Which one of the following do you use most frequently to seek online health-related information?

□ Website (1)

□ App (2)

□ Other (Please Specify) (3) _____

Q2. Please specify the online source that you use most frequently to look for health-related information.
(e.g. healthinfo.org.nz, mayoclinic.org, webmd.com, etc.)
_____

The following questions relate to the online source that you use most frequently to search for health-related information, i.e. (Name of online system specified).

Q3. How long have you been using (Name of online system specified) to look for health-related information?
Less than 1 month (1)
□ 1 month< 6 months (2)
□ 6 months< 1 year (3)
□ 1 year< 3 years (4)
□ 3 years< 5 years (5)
□ 5 year< 10 years (6)
□ 10 years or more (7)

Q4. How frequently do you look for health-related information provided **by (Name of online system specified)?**
□ About once a year or less (1)
□ A few times a year (2)
□ About once a month (3)
□ A few times a month (4)

□ About once a week (5)
□ A few times a week (6)
□ About once a day or more (7)

Q5. How frequently do you use (Name of online system specified) to search for health-related information?

-3 -2 -1 0 +1 +2 +3

Very Infrequently Very Frequently

Q6. On average, whenever you use (Name of online system specified), how much time do you spend looking for health-related information?

□ Less than 10 minutes (1)
□ 10 minutes< 20 minutes (2)
□ 20 minutes< 30 minutes (3)
□ 30 minutes< 1 hour (4)
□ 1 hour< 2 hours (5)
□ 2 hours< 3 hours (6)
□ More than 3 hours (7)

Q7. What do you mainly use (Name of online system specified) for?
(Tick all that apply)

□ To search for information on specific health topics (1)
□ To search for general health information (2)
□ To monitor my health (3)
□ To assist with my health goals (4)
□ To search for information from health-related peer support groups (5)
□ Other (Please specify) (6) _____
□ Other (Please specify) (7) _____

Intention

Q8. The following set of questions relate to your intentions to look for health-related information using (Name of online system specified).

To what extent do you agree or disagree with the statements below? (scale shown)

-3 -2 -1 0 +1 +2 +3

Strongly Disagree Strongly Agree

- I intend to use (Name of online system specified) more frequently to search for health-related information online over the next year
- I plan to increase my use of (Name of online system specified) to seek out health-related information over the next year
- I plan to look for health-related information using (Name of online system specified) over the next year
- I intend to use (Name of online system specified) to look for health-related information at every opportunity over the next year

---

Information

Q9. The following set of questions relate to your opinions about the health-related information provided online by (Name of online system specified).

To what extent do you agree or disagree with the statements below? (scale shown)

-3	-2	-1	0	+1	+2	+3
Strongly Disagree						Strongly Agree

- Overall, I would give the health-related information provided by (Name of online system specified) a high rating in terms of quality.
- Overall, I would give the health-related information from (Name of online system specified) high marks
- In general, (Name of online system specified) provides me with high-quality health-related information.

Q10. Overall, I am ... with the health-related information provided by (Name of online system specified).

-3	-2	-1	0	+1	+2	+3
Very Dissatisfied						Very Satisfied
Very Displeased						Very Pleased
Very Disappointed						Very Delighted
Very Frustrated						Very Contented

Q11. The health-related information provided by (Name of online system specified)

-3	-2	-1	0	+1	+2	+3
Strongly Disagree						Strongly Agree

- ...is complete
- ...is clear
- ...is correct
- ...is comprehensive
- ...is understandable
- ...is error free
- ...is all the information I need
- ...is clearly presented
- ...is accurate

Q12. The health information provided by (Name of online system specified)

-3	-2	-1	0	+1	+2	+3
Strongly Disagree						Strongly Agree

- ...is the most recent information available
- ...is trustworthy
- ...is relevant to me
- ...is current
- ...is reliable
- ...is the information I am searching for

- ...is up to date
- ...is information I can depend on
- ...is applicable to me

System

Q13. For the following questions, please focus on the technology that supports the e-Health system provided by (Name of online system specified).

To what extent do you agree or disagree with the statements below? (scale shown)

-3 -2 -1 0 +1 +2 +3

Strongly Disagree Strongly Agree

- In terms of quality, I would rate (Name of online system specified) highly
- Overall, (Name of online system specified) is of high quality
- Overall, I would give the quality of (Name of online system specified) a high rating

Q14. Overall, I am ... with the e-Health system provided by (Name of online system specified).

-3 -2 -1 0 +1 +2 +3

Very Dissatisfied Very Satisfied

Very Displeased Very Pleased

Very Disappointed Very Delighted

Very Frustrated Very Contented

Q15. The (Name of online system specified) e-Health system ...

-3 -2 -1 0 +1 +2 +3

Strongly Disagree Strongly Agree

- ...performs reliably
- ...allows me to readily access health information
- ...is always functioning
- ...operates properly
- ...makes health information very accessible
- ...is always available to use
- ...never fails to operate
- ...makes health information easy to access
- ...operates dependably
- ...is accessible at all times

Source Credibility

This following set of questions relate to your opinions about the expertise and credibility of (Name of online system specified) as a source of health-related information.

Q16. In my opinion (Name of online system specified) is a(n) ... source of online health-related information.

	-3	-2	-1	0	+1	+2	+3	
Untrustworthy								Trustworthy
Disreputable								Reputable
Uncredible								Credible
Incompetent								Competent

Social Influence

Q17. The following set of questions relate to your opinions on how your family, friends, or other individuals who are important to you, feel about your use of (Name of online system specified) to find health-related information.

To what extent do you agree or disagree with the statements below? (scale shown)

-3	-2	-1	0	+1	+2	+3
Strongly Disagree						Strongly Agree

- Most people who are important to me think that I should use (Name of online system specified) to seek health-related information
- It is expected of me to use (Name of online system specified) to search for health-related information (2)
- People whose opinions I value would approve of me using (Name of online system specified) to look for health-related information

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Self-efficacy

Q18. The following set of questions relate to your beliefs about your capabilities to use (Name of online system specified) to search for health-related information.

To what extent do you agree or disagree with the statements below? (scale shown)

-3	-2	-1	0	+1	+2	+3
Strongly Disagree						Strongly Agree

- If I wanted to, I could look for relevant health-related information using (Name of online system specified)
- I could seek out relevant health-related information using (Name of online system specified) even if I had never used it before
- I am capable of looking for relevant health-related information using (Name of online system specified) without any guidance

- I am confident that I am able to search for relevant health-related information using (Name of online system specified)

Attitude

Q19. The following set of questions relate to your opinions on your use of (Name of online system specified) to search for health-related information. To what extent do you agree or disagree with the statements below?

	-3	-2	-1	0	+1	+2	+3	
Unpleasant								Pleasant
Unenjoyable								Enjoyable
Unpleasurable								Pleasurable

Q20. Overall, my use of (Name of online system specified) to search for health-related information is ...

	-3	-2	-1	0	+1	+2	+3	
Harmful								Beneficial
A Bad Idea								A Good Idea
Worthless								Valuable
Negative								Positive

Ease of Use

Q21. The following set of questions relates to your opinions about the e-Health system provided by (Name of online system specified) and how easy or difficult you feel it is to use.

To what extent do you agree or disagree with the statements below? (scale shown)

-3 -2 -1 0 +1 +2 +3

- Overall, (Name of online system specified) is easy to use
- It is easy to get (Name of online system specified) to do what I want it to do
- Learning to use (Name of online system specified) is easy for me
- Interacting with (Name of online system specified) is simple

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Perceived Usefulness

Q22. The following set of questions relate to your opinions about the e-Health system provided by (Name of online system specified) and how useful it is for seeking health-related information.

To what extent do you agree or disagree with the statements below? (scale shown)

-3 -2 -1 0 +1 +2 +3

- Using (Name of online system specified) enhances my effectiveness in searching for health-related information
- Using (Name of online system specified) makes it easier for me to look for health-related information
- (Name of online system specified) enables me to search for health-related information quickly
- Using (Name of online system specified) improves my efficiency in seeking out health-related information
- Overall, I find (Name of online system specified) useful in searching for health-related information

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Demographics

Please provide information about yourself in the following set of questions.
This information will be used for statistical purposes only, and you will not be identified.

Q23. Age

□ Under 20 years old
□ 20-24 years old
□ 25-29 years old
□ 30-34 years old
□ 35-39 years old
□ 40-44 years old
□ 45-49 years old
□ 50-54 years old
□ 55-59 years old
□ 60 years or older

Q24. Gender

□ Male
□ Female
□ Other

Q25. Which of the following best describes your highest level of education?

□ Primary School Qualification
□ Secondary School Qualification
□ Tertiary Certificate
□ Tertiary Diploma
□ Some Undergraduate Degree Study
□ Undergraduate Degree
□ Postgraduate Degree
□ Other (Please Specify) _____

Q26. Which of the following best describes your ethnic origin?

(Tick all that apply)

□ New Zealand European

□ Māori

□ Samoan

□ Cook Island Māori

□ Tongan

□ Niuean

□ Chinese

□ Indian

□ Other (Please Specify) _____

□ Prefer not to say

Appendix B: Human Ethics Committee Approval

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

HUMAN ETHICS COMMITTEE

Secretary, Rebecca Robinson
Telephone: +64 03 364 2987, Extn 45588
Email: human-ethics@canterbury.ac.nz

Ref: HEC 2016/06/LR

10 February 2016

Xiuxuan Zhu
Department of Accounting and Information Systems
UNIVERSITY OF CANTERBURY

Dear Xiuxuan,

Thank you for submitting your low risk application to the Human Ethics Committee for the research proposal titled "Understanding and identifying the factors that impact individual intentions to seek health-related information online".

I am pleased to advise that the application has been reviewed and approved.

Please note that this approval is subject to the incorporation of the following change:

Please change the Ethnicity question to the model of the 2013 Census, which allowed for multiple ethnic identification.

With best wishes for your project.

Yours sincerely

Lindsey MacDonald
Chair, Human Ethics Committee